NASA

Aerospace Medicine and Biology
A Continuing Bibliography with Indexes

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June 1987

Aerospace Medicine and Biology

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NASA SP-7011(298)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 298)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in May 1987 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 173 reports, articles and other documents announced during May 1987 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA).* The first issue of the bibliography was published in July 1964.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR,* including the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

Seven indexes — subject, personal author, corporate source, foreign technology, contract, report number, and accession number — are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1987 Supplements.

Information on the availability of cited publications including addresses of organizations and NTIS price schedules is located at the back of this bibliography.

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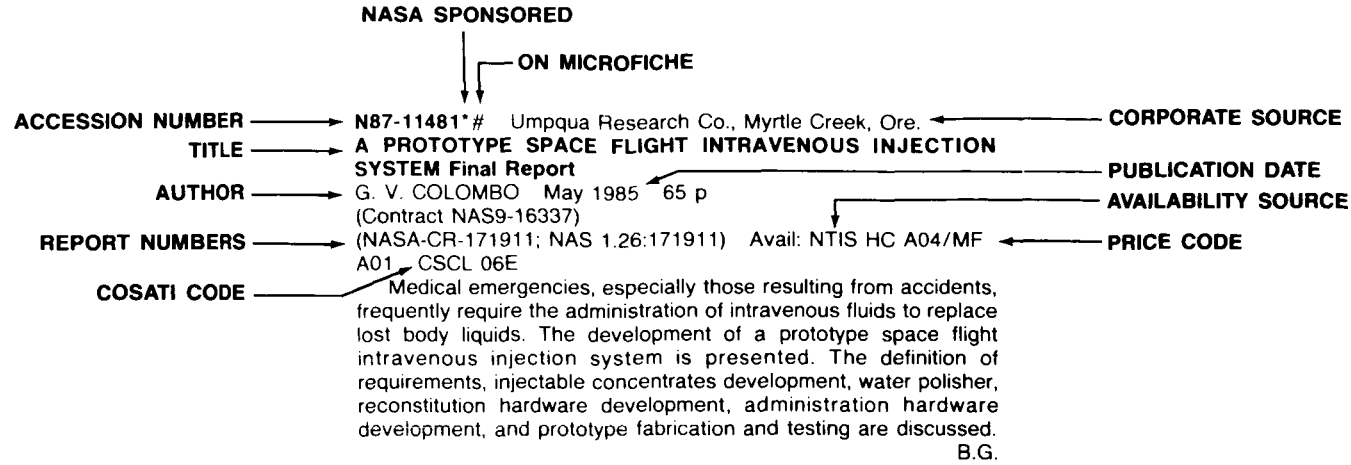
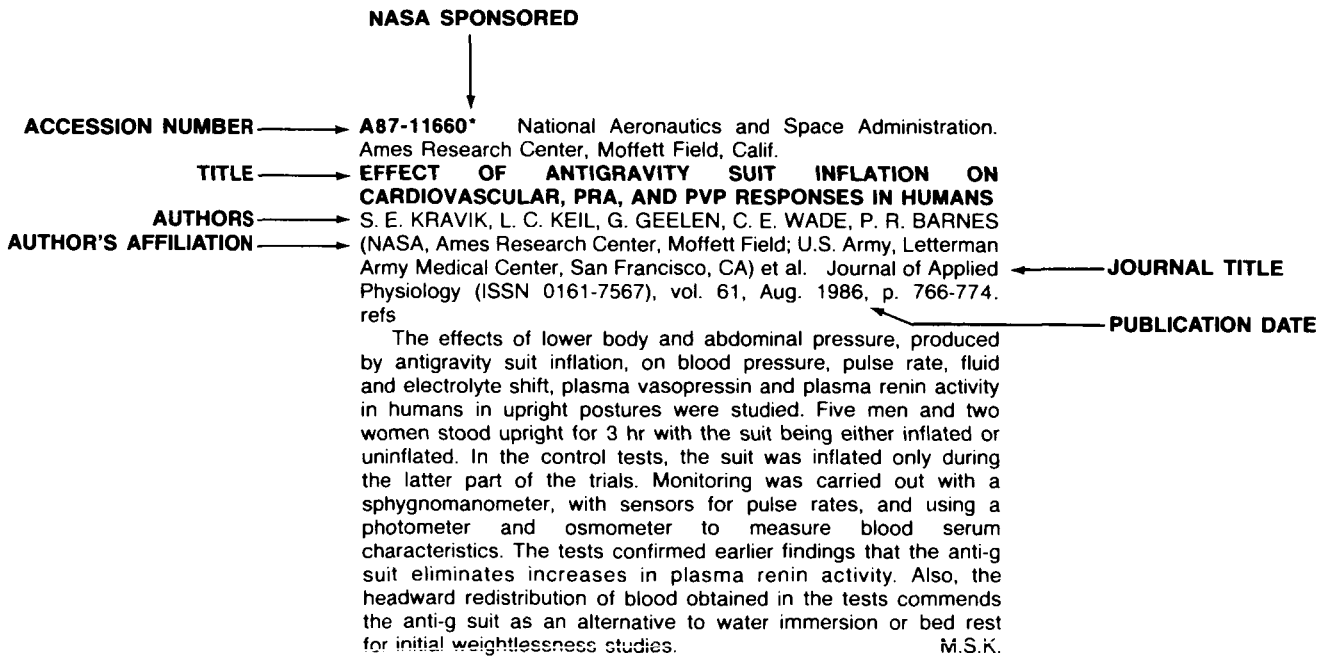
TYPICAL REPORT CITATION AND ABSTRACT



TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT



AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 298)

JUNE 1987

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LIFE SCIENCES (GENERAL)

A87-23439* Arizona Univ., Tucson.
PROTEIN TURNOVER IN ADIPOSE TISSUE FROM FASTED OR DIABETIC RATS
MARC E. TISCHLER, ALAN H. OST, and JULIA COFFMAN (Arizona, University, Tucson) Life Sciences (ISSN 0024-3205), vol. 39, no. 16, 1986, p. 1447-1452. refs
(Contract NIH-AM-28647; NAGW-227)

Protein synthesis and degradation in vitro were compared in epididymal fat pads from animals deprived of food for 48 h or treated 6 or 12 days prior with streptozotocin to induce diabetes. Although both fasting and diabetes led to depressed (-24 to -57 percent) protein synthesis, the diminution in protein degradation (-63 to -72 percent) was even greater, so that net in vitro protein balance improved dramatically. Insulin failed to inhibit protein degradation in fat pads of these rats as it does for fed animals. Although insulin stimulated protein synthesis in fat pads of fasted and 12 day diabetic rats, the absolute change was much smaller than that seen in the fed state. The inhibition of protein degradation by leucine also seems to be less in fasted animals, probably because leucine catabolism is slower in fasting. These results show that fasting and diabetes may improve protein balance in adipose tissue but diminish the regulatory effects of insulin.
Author

A87-23441* Arizona Univ., Tucson.
INCREASED RESPONSE TO INSULIN OF GLUCOSE METABOLISM IN THE 6-DAY UNLOADED RAT SOLEUS MUSCLE
ERIK J. HENRIKSEN, MARC E. TISCHLER, and DAVID G. JOHNSON (Arizona, University, Tucson) Journal of Biological Chemistry (ISSN 0021-9258), vol. 261, Aug. 15, 1986, p. 10707-10712. refs
(Contract NAGW-227; NAG2-384)

Hind leg muscles of female rats were unloaded by tail cast suspension for 6 days. In the fresh-frozen unloaded soleus, the significantly greater concentration of glycogen correlated with a lower activity ratio of glycogen phosphorylase (p less than 0.02). The activity ratio of glycogen synthase also was lower (p less than 0.001), possibly due to the higher concentration of glycogen. In isolated unloaded soleus, insulin (0.1 milliunit/ml) increased the oxidation of D(U-C-14) glucose, release of lactate and pyruvate, incorporation of D-(U-C-14) glucose into glycogen, and the concentration of glucose 6-phosphate more (p less than 0.05) than in the weight-bearing soleus. At physiological doses of insulin, the percent of maximal uptake of 2-deoxy-D-(1,2-H-3) glucose/muscle also was greater in the unloaded soleus. Unloading of the soleus increased, by 50 percent the concentration of insuling receptors, due to no decrease in total receptor number during muscle atrophy. This increase may account for the greater response of glucose metabolism to insulin in this muscle. The extensor digitorum longus, which generally shows little response to unloading, displayed no differential response of glucose metabolism to insulin.
Author

A87-23453* Arizona Univ., Tucson.
REDUCTION-OXIDATION STATE AND PROTEIN DEGRADATION IN SKELETAL MUSCLES OF GROWING RATS
JULIE M. FAGAN and MARC E. TISCHLER (Arizona, University, Tucson) Growth, vol. 50, 1986, p. 139-146. refs
(Contract PHS-AM-28647; NAGW-227)

The relationship between the NAD redox state and protein degradation during growth was studied in isolated soleus and extensor digitorum longus muscles of 4- to 14-week-old rats. As muscle size increased with age, protein breakdown slowed and the muscles became progressively more reduced as shown by higher ratios of lactate/pyruvate in incubated and fresh-frozen muscle. Correlations were strong between redox state of protein degradation, and muscle mass, and between redox state and protein degradation. This relationship may be important in the slowing of muscle breakdown that occurs with age.
Author

A87-23475
A SELECTIVE IMIDAZOBENZODIAZEPINE ANTAGONIST OF ETHANOL IN THE RAT
PETER D. SUZDAK, JOHN R. GLOWA, JACQUELINE N. CRAWLEY, ROCHELLE D. SCHWARTZ, PHIL SKOLNICK (NIH, Bethesda, MD) et al. Science (ISSN 0036-8075), vol. 234, Dec. 5, 1986, p. 1243-1247. refs

The effectiveness of the imidazobenzodiazepine (Ro15-4513) as an antagonist to the intoxication properties of ethanol (and pentobarbital- and muscinol-stimulated Cl-36(-) uptake) in rat brains was examined experimentally. The blood levels of ethanol, 20-100 mM, were at pharmacologically relevant concentrations known to stimulate gamma-aminobutyric acid (GABA) receptor-mediated uptake of Cl into brain vesicles. Micromolar doses Ro15-4513 proved to be an effective anticonflict remover in ethanol-treated rats who would undergo punishment to drink water stopped seeking water. Ro15-4513 failed to have the same effect on rats treated with pentobarbital. Further tests are required to determine if Ro15-4513 can block the ethanol-induced CNS effects mediated by other neutrotransmitter receptors or voltage-dependent channels.
M.S.K.

A87-23524
HOW ROOTS RESPOND TO GRAVITY
MICHAEL L. EVANS, KARL-HEINZ HASENSTEIN (Ohio State University, Columbus), and RANDY MOORE (Baylor University, Waco, TX) Scientific American (ISSN 0036-8733), vol. 255, Dec. 1986, p. 112-119.

The first phase of vegetal gravitropism is perception, which occurs in t he terminal 0.5 mm of the root (the cap). Secondly, in transduction, communication takes place between the cap and the response zone (third phase), where a downward curvature takes place. Organelles called amyloplasts have been found that migrate to the lowest side of the cap cells in response to changing orientation. Experimentation has shown that, in reoriented roots, the lower part of the root grows slower than the upper side, which lets a root tip curve downward. Other studies have shown that Ca(++) ions are released from the cap. The ions activate transport systems which move Ca and auxin from cell to cell along the cap, then auxin from the cap to the lower side of the

elongated, growing zone. A qualitative model is defined for the exact cell dynamics which move and respond to the Ca and auxin. M.S.K.

A87-24148
ARTERIAL BLOOD GASES AND ACID-BASE STATUS OF DOGS DURING GRADED DYNAMIC EXERCISE
TIMOTHY I. MUSCH, DANIEL B. FRIEDMAN, GEORGE C. HAIDET, JAMES STRAY-GUNDERSEN, TONY G. WALDROP (University of Texas Health Science Center, Dallas) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 61, Nov. 1986, p. 1914-1919. Research supported by the Lawson and Rogers Lacy Research Fund in Cardiovascular Diseases. refs
(Contract NIH-HL-06296; NIH-HL-07360; NIH-HL-28662)

A87-24149
ADRENERGIC AND LOCAL CONTROL OF O2 UPTAKE DURING AND AFTER SEVERE HYPOXIA
C. E. KING and S. M. CAIN (Alabama, University, Birmingham) Journal of Applied Physiology (ISSN 0161-7567), vol. 61, Nov. 1986, p. 1920-1927. Research supported by the Canadian Heart Foundation. refs
(Contract NIH-HL-26927)

The effect of regional distribution of O2 supply on adrenergic receptors is examined experimentally. The first experiment studied local control of O2 supply and regional O2 deficit and repayment by blocking alpha and beta adrenergic receptors; the second experiment stimulated alpha-adrenergic receptors in order to decrease O2 delivery by excessive vasoconstriction; and in the third experiment the beta-receptors were stimulated by isoproternol infusion in order to increase O2 delivery. The cardiac output, whole-body and hindlimb O2 uptake, end-tidal pressure of CO2 and O2, and pH were analyzed. The data reveal that the distribution of O2 deficit to tissues during severe hypoxia and O2 repayment in recovery is due to local metabolic factors rather than to external neural or humoral effects. I.F.

A87-24248
THERMODEPOLARIZATION ANALYSIS OF PURPLE MEMBRANE FILMS OF HALOBACTERIA [TERMODEPOLIARIZATSIONNYI ANALIZ PLENOK PURPURNYKH MEMBRAN GALOBAKTERII]
G. P. BORISEVICH, A. P. PONOMAREV, and A. A. KONONENKO (Moskovskii Gosudarstvennyi Universitet; Moskovskii Institut Elektronnogo Mashinostroeniia, Moscow, USSR) Biofizika (ISSN 0006-3029), vol. 31, Sept.-Oct. 1986, p. 804-809. In Russian. refs

A87-24249
THE EFFECT OF MILLIMETER-RANGE ELECTROMAGNETIC OSCILLATIONS ON THE BLOOD SYSTEM OF ANIMALS DEPENDING ON THE ANIMAL'S INITIAL STATUS AND THE ZONE OF IRRADIATION [VLIIANIE ELEKTROMAGNITNYKH KOLEBANII MILLIMETROVOGO DIAPAZONA NA SISTEMU KROVI ZHIVOTNYKH V ZAVISIMOSTI OT IKH ISKHODNOGO SOSTOIANIIA I ZONY OBLUCHENIIA]
N. P. DIDENKO, V.M. PERELMUTER, M. E. GUREVICH, Z. I. RZHEVSKAIA (Tomskii Politekhnicheskii Institut, Tomsk, USSR), and V. A. CHA Biofizika (ISSN 0006-3029), vol. 31, Sept.-Oct. 1986, p. 882-885. In Russian.

The effect of millimeter-range microwaves on the characteristics of blood cells and bone marrow preparations was studied, using mice irradiated by microwaves aimed either at the left or at the right hind leg. It was found that, in mice with low (less than 12 x 10 to the 9th/l) initial leukocyte numbers, a 1-h exposure to microwaves stimulated erythrocytopoiesis and induced a change of the lymphocyte number in the blood; the high-leukocyte animals were almost insensitive to microwave radiation. The reaction depended on the site of irradiation. In mice irradiated on the left, lymphopenia and erythropoietic changes in the bone marrow of the thorax and left thigh were observed. In animals irradiated on the right side, lymphocytosis and stimulation of erythropoiesis in the right-thigh bone marrow were observed. A mechanism likely to be responsible for the observed changes is proposed. I.S.

A87-24250
ORIENTATION OF WHEAT ROOTS UNDER THE EFFECT OF THE GEOMAGNETIC FIELD [ORIENTATSIIA KORNEI PSHENITSY POD DEISTVIEM GEOMAGNITNOGO POLIA]
N. I. BOGATINA, V. M. LITVIN, and M. P. TRAVKIN (Belgorodskii Gosudarstvennyi Pedagogicheskii Institut, Belgorod, USSR) Biofizika (ISSN 0006-3029), vol. 31, Sept.-Oct. 1986, p. 886-890. In Russian.

A87-24259
ORGANIZATION AND SUPRABULBAR CONTROL OF THE BARORECEPTOR REFLEX ARC [ORGANIZATSIIA I SUPRABUL'BARNYI KONTROL' DUGI BARORETSEPTORNOGO REFLEKSA]
V. A. TSYRLIN (Leningradskii Nauchno-Issledovatel'skii Institut Kardiologii, Leningrad, USSR) Uspekhi Fiziologicheskikh Nauk (ISSN 0301-1798), vol. 17, Oct.-Dec. 1986, p. 24-37. In Russian. refs

Data concerning the organization of the baroreceptor reflex arc are discussed, together with data illustrating the role of stress in the baroreceptor reflex regulation of circulation. It is shown that electric stimulation of hypothalamus leads to inhibition of both chronotropic and vasomotor components of the baroreceptor reflex. A hypothesis is presented according to which the suppression of baroreceptor reflex due to emotional stress leads to an elevation of arterial pressure. I.S.

A87-24260
CORONAROGENIC METABOLIC ACIDOSIS AND THE PROBLEMS OF ITS PHARMACOLOGICAL CORRELATION [KORONAROGENNYI METABOLICHESKII ATSIDOZ I PROBLEMA EGO FARMAKOLOGICHESKOI KORRELIATSII]
V. V. GATSURA and A. F. SIDORENKO (Nauchno-Issledovatel'skii Institut po Biologicheskim Ispytaniiam Khimicheskikh Soedineni, Staraya Kupavna, USSR) Uspekhi Fiziologicheskikh Nauk (ISSN 0301-1798), vol. 17, Oct.-Dec. 1986, p. 38-56. In Russian. refs

Evidence concerning the role of severe acidosis in triggering pathogenic processes in an ischemic heart injury is discussed, together with data concerning the role of mild acidosis in mobilization of compensatory reactions and provision of energy necessary for the survival of the tissue under the conditions of myocardial ischemia. Possible means of alleviating intracellular coronarogenic metabolic acidosis and the connected myocardial injury are considered. The antiacidotic effects of electron-accepting systems and compounds with high redox potential are examined, considering both the endogenic and exogenic sources of such neutralizers. The need is emphasized for developing pH-dependent carrier-bound electron receptors which would be released from their polymer-carrier moiety in the cells of a myocardial zone with marked intracellular metabolic acidosis. I.S.

A87-24261
INDIVIDUAL VARIATIONS IN THE ADAPTATION TO HYPOXIA AND TO COLD ACCORDING TO THE CRITERION OF EMOTIONAL-BEHAVIORAL REACTIVITY [INDIVIDUAL'NYE RAZLICHIIA V ADAPTATSII K GIPOKSII I KHOLODU PO KRITERIIU EMOTSIONAL'NO-POVEDENCHESKOI REAKTIVNOSTI ORGANIZMA]
V. B. ZAGUSTINA, Z. A. ALEKSANIAN, and N. N. VASILEVSKII (Nauchno-Issledovatel'skii Institut Eksperimental'noi Meditsiny, Leningrad, USSR) Uspekhi Fiziologicheskikh Nauk (ISSN 0301-1798), vol. 17, Oct.-Dec. 1986, p. 68-84. In Russian. refs

Data concerning the relationships between the emotional-behavioral stability of an individual, the individual's ability for cold adaptation capability, and the individual's hypoxia adaptation capacity were obtained on rats, using 19 behavioral parameters to evaluate anxiety, aggressiveness, domineering tendencies, and stability with respect to external provocation. It was found that rats with low levels of anxiety and sensitivity to provocation, and a high tendency to social domineering had higher

adaptability to acute hypoxic hypoxia than other rats. Using different sequences of successive exposures to cold and hypoxia, it was found that, in the combination of cold exposure followed by hypoxia, relative stability with respect to hypoxia increased above the control levels, whereas, in the reverse combination, the stability to hypoxia returned to the control levels. I.S.

A87-24266
A NEW TYPE OF CHROMOSOME ABERRATIONS IN MICROSPORES OF TRADESCANTIA PALUDOSA OBSERVED IN EXPERIMENTS ON BOARD SATELLITES [NOVYI TIP KHROMOSOMNYKH MUTATSII, ZAREGISTRIROVANNYI V MIKROSPORAKH TRADESCANTIA PALUDOSA PRI EKSPERIMENTAKH NA KOSHICHESKIKH KORABLIAKH-SPUTNIKAKH]
N. L. DELONE, V. V. ANTIPOV, and G. P. PARFENOV (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 290, no. 4, 1986, p. 979-981. In Russian.

A87-24275
DESULFUROCOCCUS AMYLOLTYICUS N.SP - NEW SPECIES OF EXTREMAL-THERMOPHILIC ARCHAEOBACTERIA FROM HYDROTHERMAL SYSTEMS [DESULFUROCOCCUS AMYLOLYTICUS N.SP. - NOVYI VID EKSTREMAL'NO-TERMOFIL'NOI ARKHEBAKTERII IZ GIDROTERM]
GIDROTERM]
E. A. BONCH-OSMOLOVSKAIA, A. I. SLESAREV, M. L. MIROSHNICHENKO, and T. P. SVETLICHNAIA (AN SSSR, Institut Mikrobiologii, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 290, no. 5, 1986, p. 1259-1263. In Russian. refs

A87-24375
STUDY OF THE ROLE OF PEROXIDATIVE OXIDATION OF LIPIDS IN CHANGING THE SENSITIVITY OF RAT LIVER TO GLUCOCORTICOIDS DURING COLD ADAPTATION [IZUCHENIE ROLI REAKTSII PEREKISNOGO OKISLENIIA LIPIDOV V IZMENENII CHUVSTVITEL'NOSTI PECHENI KRYS K GLIUKOKORTIKOIDAM PRI KHOLODOVOI ADAPTATSII]
V.G. SELIATITSKAIA, N. G. KOLOSOVA, I. A. GERLITS, V. IU. KULIKOV, and IU. P. SHORIN (Institut Klinicheskoi i Eksperimental'noi Meditsiny, Novosibirsk, USSR) Fiziologicheskii Zhurnal (Kiev) (ISSN 0201-8489), vol. 32, Sept.-Oct. 1986, p. 533-537. In Russian. refs

A87-24860
GIANT SUBTIDAL STROMATOLITES FORMING IN NORMAL SALINITY WATERS
EUGENE A. SHINN (USGS, Miami Beach, FL), ANTHONY T. JONES, KEVIN KELLY (Hawaii, University, Honolulu), RANDOLPH P. STEINEN (Connecticut, University, Storrs), and ROBERT F. DILL Nature (ISSN 0028-0836), vol. 324, Nov. 6, 1986, p. 55-58. Research supported by the Caribbean Marine Research Center and NOAA. refs

The distribution, composition and formative processes for giant lithified subtidal columnar stromatolites which were recently found in current-swept channels by the Exuma Islands on the Bahama Bank, are described. Stromatolites are candidate sources for free oxygen in the Precambrian era. Located in fence-like rows growing to 1-2.5 m heights equal to those of nearby ooid sand dunes, the stromatolites have pustulate, filamentary, and smooth features on their surfaces. No green algae were found on the stromatolites which, when dissected, exhibited various laminated forms, sometimes incorporating spicules. Processes by which the stromatolites grew by the trapping of sand in layers cemented by exudations of marine organisms are discussed. M.S.K.

A87-24867
VEGETATION, CLIMATIC AND FLORAL CHANGES AT THE CRETACEOUS-TERTIARY BOUNDARY
JACK A. WOLFE and GARLAND R. UPCHURCH, JR. (USGS, Denver, CO) Nature (ISSN 0028-0836), vol. 324, Nov. 13, 1986, p. 148-152. refs

Studies of the leaf flora in the western interior of North America are used to provide data on the effects of a terminal Cretaceous event on the land flora, vegetation, and climate. It is concluded that at the K-T boundary there were: (1) high levels of extinction in the south and low levels in the north; (2) major ecological disruption followed by long-term vegetational changes that mimicked normal ecological succession; (3) a major increase in precipitation; and (4) a brief, low-temperature excursion, which supports models of an 'impact winter'. C.D.

A87-25147
MATHEMATICAL METHOD FOR IDENTIFYING BIOLOGICAL AND HELIOGEOPHYSICAL RHYTHMS OF DIFFERENT FREQUENCY [MATEMATICHESKII METOD VYIAVLENIIA BIOLOGICHESKIKH I GELIOGEOFIZICHESKIKH RITMOV RAZNOI CHASTOTY]
IU. M. NIKITIN, E. N. CHIRKOVA, and V. V. NEMOV (Glavnyi Voennyi Klinicheskii Gospital', Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 290, no. 6, 1986, p. 1347-1351. In Russian.

Attention is given to the problem of finding a procedure for determining a hierarchy of rhythms of different dimensionality in the dynamics of biological and heliogeophysical indices. A set of mathematical methods is proposed in order to eliminate the limitations of spectral analysis connected with the identification of biorhythms of different dimensionality. As an example, the proposed approach is used to identify monthly and weekly biorhythms in variations of the number of leukocytes in a healthy subject. It is concluded that the proposed approach for identifying latent periodicities is applicable to the determination of biorhythms and heliorhythms with unknown periods and phase in the case of a small number of sample values. B.J.

A87-25164
PROSTAGLANDINS AND THE INTERPHASE DEATH OF IRRADIATED CELLS [PROSTAGLANDINY I INTERFAZNAIA GIBEL' OBLUCHENNYKH KLETOK]
E. F. ROMANTSEV, Z. I. ZHULANOVA, E. N. PRIANISHNIKOVA, T. I. NIKANDROVA, and V. S. AGAFEVA (Institut Biofiziki, Moscow, USSR) Radiobiologiia (ISSN 0033-8192), vol. 26, Sept.-Oct. 1986, p. 579-590. In Russian. refs

The role played by radiation-induced changes in the metabolism and functioning of intracellular prostaglandins (PGs) in the interphase death of irradiated cells is examined. Correlations between the biosynthesis of PGs and the biosyntheses of DNA and RNA are discussed, together with the pathways of biosynthesis of different PGs and the role of PG-receptors and SH-groups in their regulatory activity. It is proposed that the radiation-induced structural and functional changes in cellular membranes lead to disruptive changes in the synthesis of PGs (as well as of other biochemically active molecules). These changes cause alterations in the DNA biosynthesis and RNA transcription, which in turn trigger the mechanisms directly responsible for the death of nondividing cells. I.S.

A87-25165
THE PROBLEM OF PEROXIDATION IN RADIOBIOLOGY [PROBLEMA PEREKISNOGO OKISLENIIA V RADIOBIOLOGII]
V. A. BARABOI and E. E. CHEBOTAREV (Kievskii Nauchno-Issledovatel'skii Rentgeno-Radiologicheskii i Onkologicheskii Institut, Kiev, Ukrainian SSR) Radiobiologiia (ISSN 0033-8192), vol. 26, Sept.-Oct. 1986, p. 591-597. In Russian. refs

The role of free radicals (FRs) and other cytotoxins in the development of pathological symptoms that accompany different types of stresses, including radiation-induced stress, is discussed together with the protective role of biological antioxidants. It is

argued that products of FR-induced oxidation of lipids, phenols, and indols which are produced under the effect of ionizing radiation are similar to the compounds found in an organism subjected to emotional, analgesic, hypoxic and other stresses. It is suggested that, in spite of the differences in primary effects of the two types of stresses, i.e., the radiation stress primarily induces the FR formation, while the emotional-analgesic stresses primarily stimulate the homeostasis with peroxidation as the secondary effect; the products of FR-oxidation act as the mediators of the stress syndrome in both cases. I.S.

A87-25166
RELIABILITY OF AUTOREGULATORY MECHANISMS IN BIOSYSTEMS SUSBJECTED TO IONIZING RADIATION [NADEZHNOST' AVTOREGULIATORNYKH MEKHANIZMOV V BIOSISTEMAKH PRI VOZDEISTVII IONIZIRUIUSHCHEI RADIATSII]
V. A. BARABOI, G. I. GROZOVSKII, and V. E. OREL (Kievskii Nauchno-Issledovatel'skii Rentgeno-Radiologicheskii i Onkologicheskii Institut, Kiev, Ukrainian SSSR) Radiobiologiia (ISSN 0033-8192), vol. 26, Sept.-Oct. 1986, p. 637-641. In Russian. refs

Using rats subjected to whole-body irradiation, progressive changes in spontaneous chemoluminescence of blood serum and in concentrations of malonic dialdehye in red blood cells were measured for different radiation doses. These data were used as parametric fluctuations in an analysis that was designed to establish the reliability of a biosystem in the process of adaptation and homeostasis in terms of a stochastic processes theory developed for autoregulatory systems with random parameters. The analysis of the parameter fluctuations made it possible to predict the adaptability of the system and to make timely corrections. I.S.

A87-25167
EXPERIMENTAL MODELING OF AUTOIMMUNE REACTIONS UNDER THE EFFECT OF NONIONIZING MICROWAVE RADIATION [EKSPERIMENTAL'NOE MODELIROVANIE AUTOIMMUNNYKH REAKTSII PRI VOZDEISTVII NEIONIZIRUIUSHCHEI MIKROVOLNOVOI RADIATSII]
G. I. VINOGRADOV and G. M. NAUMENKO (Kievskii Nauchno-Issledovatel'skii Institut Obshchei i Kommunal'noi Gigieny, Kiev, Ukrainian SSR) Radiobiologiia (ISSN 0033-8192), vol. 26, Sept.-Oct. 1986, p. 705-708. In Russian. refs

Data were obtained demonstrating the possibility of simulating autoimmune syndrom in Wistar rats by immunizing intact rats with extracts of bone marrow obtained from rats irradiated for 30 days, 7 h/day, with microwaves of 50 and 500 microwatt/sq cm intensity. Compared with noninjected controls and with rats injected with extracts from nonirradiated animals, the rats immunized with extracts from irradiated animals displayed significant increases in the percentages of basophil degranulation and plaque-forming cells and in the level of complement fixation, measured two and three weeks following immunization. The levels of autoimmune reactions were highest in rats immunized with extracts from donors irradiated at the intensity of 500 microwatt/sq cm. I.S.

A87-25168
THE EFFECT OF CONTINUOUS AND MODULATED LASER IRRADIATION ON THE ACTIVITY OF THE GLUTAMIC-ACID-METABOLISM ENZYMES IN RAT TISSUES [VLIIANIE NEPRERYVNOGO I MODULIROVANNOGO LAZERNOGO IZLUCHENIIA NA AKTIVNOST' FERMENTOV OBMENA GLUTAMINOVOI KISLOTY V TKANIAKH KRYS]
A. T. PIKULEV, T. N. ZYRIANOVA, V. M. LAVROVA, V. A. MOSTOVNIKOV, S. V. NECHAEV (Belorusskii Gosudarstvennyi Universitet; AN BSSR, Institut Fiziki, Minsk, Belorussian SSR) et al. Radiobiologiia (ISSN 0033-8192), vol. 26, Sept.-Oct. 1986, p. 712-714. In Russian. refs

A87-25169
THE EFFECT OF LOCALIZED MICROWAVE IRRADIATION OF THE RAT FOOT ON THE IMPULSE ACTIVITY IN THE TIBIAL NERVE [VLIIANIE LOKOL'NOGO SVCH-OBLUCHENIIA STOPY KRYSY NA IMPUL'SNUIU AKTIVNOST' V BOL'SHEBERTSOVOM NERVE]
A. A. ARIFULIN, M. S. BURENKOV, and V. V. ENGOVATOV (Institut Biofiziki, Moscow, USSR) Radiobiologiia (ISSN 0033-8192), vol. 26, Sept.-Oct. 1986, p. 715, 716. In Russian. refs

Data are presented on the effect of the microwave irradiation of a rat foot on the impulse activity of partially isolated tibial nerve. Impulsive activity was registered in 60 individual afferent fibers, selected from 24 rats subjected to different levels (from 0.04 to 103 mW/sq cm) of radiation intensity. Of the 60 fibers tested, 46 (77 percent) displayed significant changes in impulse activity, compared with the spontaneous activity levels of nonirradiated controls. Microwaves of all intensity levels were observed to modify the impulse activity of the afferent fibers, mainly by an increase in a current average frequency, indicating that even microwaves of very low current density (0.04-0.08 mW/sq cm) can stimulate afferent structures. I.S.

A87-25170
THE ROLE OF RADIOPROTECTORS IN THE EFFECTIVENESS OF THE TREATMENT OF COMBINED RADIATION INJURIES [VLIIANIE RADIOPROEKTOROV NA EFFEKTIVNOST' LECHENIIA KOMBINIROVANNYKH RADIATSIONNYKH PORAZHENII (OBZOR LITERATURY)]
M. N. FARSHATOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), July 1986, p. 22-25. In Russian. refs

The beneficial role of cystamine in treatments of combined radiation injuries, i.e., when burns, wounds, or shock are also present, is discussed. Data are presented illustrating the protective effect of cystamine on the survival rate of animals irradiated with gamma rays and suffering from radiation sickness complicated by the presence of skin burns, wounds, etc., which intensify the harmful effect of body irradiation. The protective effects of cystamine include significant increases of effective lethal dose, decreased leukopenia, and decreased wound infections. The stimulating role of cystamine in hemopoiesis is discussed. I.S.

A87-25198
CHANGES IN THE FUNCTIONAL ACTIVITY OF CEREBRAL CORTICAL STRUCTURES AND IN THEIR BLOOD SUPPLY IN ALERT RABBITS SUBJECTED TO ROCKING MOTION [IZMENENIIA FUNKTSIONAL'NOI AKTIVNOSTI KORKOVYKH STRUKTUR MOZGA I IKH KROVOSNABZHENIE PRI UKACHIVANII U BODRSTVUIUSHCHIKH KROLIKOV]
V. F. MAKSIMUK (AN SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR) and N. A. SKOROMNYI (Krymskii Meditsinskii Institut, Simferopol, Ukrainian SSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, July 1986, p. 881-887. In Russian. refs

The effect of motion sickness on the dynamics of cardiovascular parameters, cerebral blood flow, and cortical bioelectrical activity was studied in unanesthetized rabbits subjected to repeated one-hour sessions of rocking motion. Rocking motion was found to induce bradycardia, hypotension, an increase in cerebral blood flow, and changes in the electrocorticogram frequency components. The observed increases in bioelectric activities of the visual and auditory cortical zones were more pronounced than those of the motor zone. All observed changes were more pronounced after the second rocking session, as compared with the first session, but decreased after the third rocking. In the summer, the bioelectric responses to rocking were less pronounced and of shorter duration, than in the winter season. It is proposed that the ability of the nervous system to adapt to rocking stimulus is greater in the summer than in the winter season. I.S.

A87-25199
DYNAMICS OF CERTAIN CHARACTERISTICS OF SYMPATHETIC GANGLIA OF ANIMALS SUBJECTED TO CHEMICAL DESYMPATHIZATION AT HIGH ALTITUDE [DINAMIKA NEKOTORYKH KHARAKTERISTIK SIMPATICHESKIKH GANGLIEV ZHIVOTNYKH, PODVERGNUTYKH KHIMICHESKOI DESIMPATIZATSII V USLOVIIAKH VYSOKOGOR'IA]
S. B. DANIIAROV, A. I. KALMAMBETOVA, and E. M. BEBINOV (Kirgizskii Gosudarstvennyi Meditsinskii Institut, Frunze, Kirgiz SSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, July 1986, p. 902-907. In Russian. refs

The effect of adaptation of rats to high altitude on the dynamics of changes induced in sympathetic ganglia by a sympatholytic agent was studied in animals injected with guanethidine (25 mg/kg body wt). The state of the ganglia was evaluated by microscopic examination and by quantization of catecholamine concentrations in unaffected cells in tissue samples collected 7, 14, 21, and 30 days after the injection. It was found, that in rats adapted to high altitude (3200 m above sea level), the number of adrenergic neurons destroyed by guanethidine was smaller, and the catecholamine-specific fluorescence in unaffected cells was higher than in rats kept at the low-altitude location. I.S.

A87-25200
THE ROLE OF THE STATE OF SERUM WATER IN OSMOLALITY REGULATION IN GROUND SQUIRRELS DURING SPONTANEOUS AWAKENING [ROL' SOSTOIANIIA VODY SYVOROTKI KROVI V REGULIATSII EE OSMOLIAL'NOSTI U SUSLIKA PRI SPONTANNOM PROBUZHDENII]
IU. G. MONIN and O. A. GONCHAREVSKAIA (AN SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, July 1986, p. 982-986. In Russian. refs

The effect of spontaneous awakening (in January) from hybernation on the serum water and salt regulation in ground squirrel (Citellus undulatus Pall) was studied by analyzing the concentrations of inorganic and organic components of blood serum and of the ultrafiltrate. Spontaneous awakening of animals was accompanied by increases of serum and ultrafiltrate concentrations of K and Na and by a decrease of ultrafiltrate content of Mg. The water contents in serum and ultrafiltrate were not changed. I.S.

A87-25814
UNIVERSAL REGULARITIES IN PROTEIN PRIMARY STRUCTURE PREFERENCE IN BONDING AND PERIODICITY
ORLIN CH. IVANOV (B'lgarska Akademiia na Naukite, Institut po Organichna Khimiia, Sofia, Bulgaria) and BERTHOLD FOERTSCH (Max-Planck-Institut fuer Biochemie, Munich, West Germany) Origins of Life (ISSN 0302-1688), vol. 17, 1986, p. 35-49. Research supported by the Max-Planck-Gesellschaft. refs

Utilizing the whole protein data base as well as parts of it (groups and individual representatives), the universal character of the regularities in protein primary structure preference in bonding (self-ordering) and periodicity - is shown by means of an improved procedure of checking statistical significance. In the vast majority of the cases there is a preference in bonding with the same or with very similar amino acid. Taken as a whole, both regularities show a universal character. The results obtained provide evidence in favor of the conception about the priority of proteins as information polymers. Author

A87-25951* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OSTEOBLAST HISTOGENESIS IN PERIODONTAL LIGAMENT AND TIBIAL METAPHYSICS DURING SIMULATED WEIGHTLESSNESS
PAUL J. FIELDER, EMILY R. MOREY, and W. EUGENE ROBERTS (NASA, Ames Research Center, Moffett Field; University of the Pacific, San Francisco, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Dec. 1986, p. 1125-1130. Research supported by the Pacific Dental Research Foundation. refs
(Contract NAGW-356; NCC2-224)

Utilizing the nuclear morphometric assay for osteoblast histogenesis, the effect of simulated weightlessness (SW) on the relative numbers of the periodontal ligament (PDL) osteoblast progenitors and on the total number of osteogenic cells was determined in rats. Weightlessness was simulated by subjecting rats to continuous 30-deg head-down posture using a modified back-harness device of Morey (1979). The response of a partially unloaded, weight-bearing bone, tibial primary spongiosa (PS), was compared to a normally loaded, nonweight-bearing PDL bone. Data indicated a similar differentiation sequence in PS and PDL, which suggests that these bones might be sensitive to the same systemic factors. Preosteoblast numbers were seen to decrease in both nonweight-bearing and weight-bearing bones during SW (compared with rats not exposed to SW), indicating the importance of systemic mediators, such as cephalad fluid shift, physiological stress, and/or growth retardation. I.S.

A87-25952
EFFECTS OF HYPERGRAVITY ON 'WHOLE-BLOOD' CULTURES OF HUMAN LYMPHOCYTES
GIOVANNA LORENZI, PIA FUCHS-BISLIN, and AUGUSTO COGOLI (Zuerich, Eidgenoessische Technische Hochschule, Zurich, Switzerland) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Dec. 1986, p. 1131-1135. Research supported by the Eidgenoessische Technische Hochschule Zuerich. refs
(Contract SNSF-3,382,0,82)

The purpose of this paper is to present a detailed description of the effects of hypergravity on the mitogenic response of human lymphocytes to concanavalin A. The effect on cultures of lymphocytes isolated from peripheral blood are compared with those on whole-blood cultures obtained by diluting fresh blood with culture medium 1:10. Whole-blood cultures of lymphocytes from crew members will be investigated inflight on the Spacelab missions D-1 and SLS-1. In hypergravity, there is an increase in lymphocyte activation of up to 500 percent. A similar increase can be induced by preincubating the cultures in hypergravity prior to exposure to concanavalin A at 1 G. The effect is less evident in cultures of isolated lymphocytes. The influence of autologous plasma and erythrocytes has also been investigated. Plasma and hypergravity have a synergistic and positive effect on lymphocyte activation, i.e., cultures of separated lymphocytes show the highest activation when incubated at 10 G and supplemented with autologous plasma. Conversely, erythrocytes depress lymphocyte activation. Author

A87-25954* Harvard Univ., Boston, Mass.
RESYNCHRONIZATION OF CIRCADIAN SLEEP-WAKE AND TEMPERATURE CYCLES IN THE SQUIRREL MONKEY FOLLOWING PHASE SHIFTS OF THE ENVIRONMENTAL LIGHT-DARK CYCLE
D. B. WEXLER and M. C. MOORE-EDE (Harvard University, Boston, MA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Dec. 1986, p. 1144-1149. refs
(Contract AF-AFOSR-78-3560; NSG-9054)

Circadian rhythms in physiological and behavioral functions gradually resynchronize after phase shifts in environmental time cues. In order to characterize the rate of circadian resynchronization in a diurnal primate model, the temperature, locomotor activity, and polygraphically determined sleep-wake states were monitored in squirrel monkeys before and after 8-h phase shifts of an

environmental light-dark cycle of 12 h light and 12 h dark (LD 12:12). For the temperature rhythm, resynchronization took 4 d after phase delay shift and 5 d after phase advance shift; for the rest-activity cycle, resynchronization times were 3 d and 6 d, respectively. The activity acrophase shifted more rapidly than the temperature acrophase early in the post-delay shift interval, but this internal desynchronization between rhythms disappeared during the course of resynchronization. Further study of the early resynchronization process requires emphasis on identifying evoked effects and measuring circadian pacemaker function. Author

A87-25956
EFFECT OF DIETARY PROTEIN QUALITY ON THE SERUM ENZYMES OF RATS EXPOSED TO SIMULATED HYPOBARIC HYPOXIC STRESS
S. K. NIKUMB, K. SANTHANAM, and M. V. RAMA RAO (Defence Food Research Laboratory, Mysore, India) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Dec. 1986, p. 1154-1157. refs

Changes in dietary protein quality and high altitude stress alter the serum urea cycle enzyme activities. To find a dietary protein which will facilitate quicker acclimatization to altitude stress, groups of rats were fed two diets, isocaloric and isonitrogenous, but differing in amino acid make up. The rats were exposed to simulated altitude stress of 0.5 atmospheric pressure for various periods up to 65 h. When serum arginase and ornithine transcarbamylase activities were assayed, it was seen that the group on the unbalanced protein (Cajanus cajan) diet showed less increase on exposure and a tendency to return to normal level earlier than the group on the balanced protein (egg) diet. Author

A87-26195* Louisville Univ., Ky.
INTERFERON IN RESISTANCE TO BACTERIAL AND PROTOZOAN INFECTIONS
GERALD SONNENFELD, CHERYL L. GOULD, FELIPE KIERSZENBAUM, ANTONIE L. W. DEGEE, and JOHN M. MANSFIELD (Louisville, University, KY; Michigan State University, East Lansing; Wisconsin, University, Madison) IN: The biology of the interferon system 1985. Amsterdam, Elsevier Science Publishers, 1986, p. 291-297. refs
(Contract NCC2-213; NIH-AI-14848; NIH-AI-17041; NIH-AI-22441; NIH-RR-05375)

The effects of genetic differences in mouse strains on the modulation of protozoan infections by interferon (IFN) were investigated. In one set of experiments, three different strains of mice were injected with T. cruzi, and their sera were assayed at five time intervals for IFN titer. A greater quantity of IFN was produced by mouse strains that were susceptible to T. cruzi infection than by the more resistant strain. In another set of experiments, spleen cell cultures from inbred strains of mice were challenged with an antigen made from T.b. rhodesiense. The cells from mice resistant to infection, produced greater amounts of IFN-gamma than did cells from the susceptible mice. In a third set of experiments, it was found that mice injected with T.b. rhodesiense before being infected with a diabetogenic virus (EMC-D) were resistant to the effects of the virus and did not produce virus-specific antibody. I.S.

A87-26198* Arizona Univ., Tucson.
REDUCTION-OXIDATION STATE AND PROTEIN DEGRADATION IN SKELETAL MUSCLE OF FASTED AND REFED RATS
JULIE M. FAGAN and MARC E. TISCHLER (Arizona, University, Tucson) Journal of Nutrition (ISSN 0022-3166), vol. 116, 1986, p. 2028-2033. refs
(Contract PHS-AM-28647; NAGW-227)

Redox state and protein degradation were measured in isolated muscles of fasted (up to 10 d) and refed (up to 4 d) 7- to 14-wk-old rats. Protein degradation in the extensor digitorum longus muscle, but not in the soleus muscle, was greater in the fasted rats than in weight-matched muscle from fed rats. The NAD couple was more oxidized in incubated and fresh extensor digitorum longus muscles and in some incubated soleus muscles of fasted rats than in weight-matched muscle from fed rats. In the extensor digitorum longus muscle of refed or prolonged fasted rats, protein degradation was slower and the NAD couple was more reduced than in the fed state. Therefore, oxidation of the NAD couple was associated with increased muscle breakdown during fasting, whereas reduction of the NAD couple was associated with muscle conservation and deposition. Author

A87-26282
RADIOPROTECTIVE ACTIVITY OF CYSTAMINE AND GAMMAPHOS UNDER GAMMA-RAY IRRADIATION [RADIOZASHCHITNOE DEISTVIE TSISTAMINA I GAMMAFOSA PRI VOZDEISTVII GAMMA-LUCHEI]
P. KUNA Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Aug. 1986, p. 72-74. In Russian. refs

The radioprotective efficiencies of intramuscular injections (20 min prior to irradiation) of cystamine and gammaphos (aminopropyl-aminoehyl thiophosphoric acid) were compared, using dogs irradiated with Co-60. To alleviate the intestinal tract side effects, the animals receiving these drugs were also injected with metoclopramide. The efficiency of the two drugs was evaluated from the rate of survival and from hematological indexes. Animals receiving either cystamine or gammaphos (in combination with antibiotics) exhibited a significantly higher rate of survival (67 percent after 45 days versus about 17 percent of controls) and less severe changes of hematological indexes. Gammaphos was somewhat more efficient than cystamine in terms of protection of blood tissue. I.S.

A87-26301
LIPID PEROXIDATION IN CEREBRAL SYNAPTOSOMES OF RATS UNDER SLEEP DISTURBANCE [PEREKISNOE OKISLENIE LIPIDOV SINAPTOSOM GOLOVNOGO MOZGA KRYS PRI NARUSHENII SNA]
N. P. TARANOVA and N. S. NILOVA (AN SSSR, Institut Fiziologii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, Aug. 1986, p. 1065-1068. In Russian. refs

The effect of sleep disturbance on the processes of lipid peroxidation in cerebral synaptosomes was studied in rats deprived of the paradoxical phase of sleep. It was found that paradoxical sleep deprivation for 24 h inhibited lipid peroxidation at two stages: formation of diene conjugates (by 30 percent) and of Schiff's bases (by 18 percent); the level of malonic dialdehyde was not altered. Sleep disturbance also induced activation (by 25 percent) of synaptosome superoxide dismutase. It is suggested that ultrastructural modifications of the synaptic membranes due to lowered peroxidation activity caused by sleep deprivation may result in less efficient synaptic transfers. I.S.

A87-26302
THE EFFECT OF A LOW-FREQUENCY MAGNETIC FIELD ON THE AUTORHYTHM OF A FROG'S ISOLATED ATRIUM [DEISTVIE NIZKOCHASTOTNOGO MAGNITNOGO POLIA NA SOBSTVENNYI RITM IZOLIROVANNOGO PREDSERDIIA LIAGUSHKI]
A. S. KOLOKOLOV, T. SH. KSHUTASHVILI, A. V. LAZAREV, O. V. NAKIPOVA, and A. N. KUZNETSOV (AN SSSR, Institut Khimicheskoi Fiziki, Moscow, USSR) Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia (ISSN 0002-3329), Nov.-Dec. 1986, p. 947-950. In Russian. refs

A87-26400
THE COMBINED EFFECT ON BLOOD CELLS OF HYPERBARIC CONDITIONS AND NEGATIVE TEMPERATURES [SOCHETANNOE DEISTVIE NA KLETKI KROVI GIPRBARII I OTRITSATEL' NYKH TEMPERATUR]
I. I. GITELZON, R. A. PAVLENKO, and IU. A. KUDENKO (AN SSSR, Institut Biofiziki, Krasnoyarsk, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 291, no. 2, 1986, p. 476-479. In Russian. refs

A87-27249* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AXOGLIAL CONTACTS IN THE AREA POSTREMA OF THE CAT - AN ULTRASTRUCTURAL STUDY
FERNANDO E. DAMELIO, MICHAEL A. GIBBS, WILLIAM R. MEHLER, DELBERT E. PHILPOTT (NASA, Ames Research Center, Moffett Field, CA), and WAYNE SAVAGE (San Jose State University, CA) *Anatomical Record* (ISSN 0003-276X), vol. 215, 1986, p. 407-412. refs
(Contract NCC2-282; NCA2-OR-675-303)

Axoglial contacts were observed in an ultrastructural study of the area postrema of the cat. According to the disposition of the electron-dense projections attached to the adjoining membranes these contacts were classified as symmetrical or asymmetrical. The axon profiles contained aggregations of clear vesicles randomly distributed or grouped in clusters adjacent to the electron-dense projections. Dense core vesicles were occasionally seen. The neuroglial profiles were either astrocytic or ependymoglial in nature. The astrocytes showed a clear cytoplasm, polymorphous vesicles, mitochondria, glycogen granules, and bundles of filaments. The ependymal cells, in contrast, had a more electron-dense and granular appearance, tubular structures, irregular vesicular formations, profiles of smooth reticuloendoplasm, and filaments grouped in bundles or isolated in the cytoplasm. The possibility that these contacts might play a role in the chemical transfer from neurons to glial cells is discussed on the basis of existing biochemical data. Author

A87-27323* Utah Univ., Salt Lake City.
THE EFFECTS OF PROSTAGLANDIN E2 IN RAPIDLY GROWING RATS DEPRESSED LONGITUDINAL AND RADIAL GROWTH AND INCREASED METAPHYSEAL HARD TISSUE MASS
K. UENO, T. HABA, D. WOODBURY, P. PRICE (Utah, University, Salt Lake City), R. ANDERSON (California, University, La Jolla) et al. Bone (ISSN 8756-3282), vol. 6, 1985, p. 79-86. refs
(Contract NIH-AM-20935; NIH-AM-27029; NAG2-108; DE-AC02-76EV-00119)

A87-27324* Kernforschungszentrum, Karlsruhe (West Germany).
AUTOMATED TRABECULAR BONE HISTOMORPHOMETRY
E. POLIG (Kernforschungszentrum Karlsruhe GmbH, Institut fuer Genetik und Toxikologie von Spaltstoffen, West Germany) and W. S. S. JEE (Utah, University, Salt Lake City) Bone (ISSN 8756-3282), vol. 6, 1985, p. 357-359. refs
(Contract NIM-AM-31844; NIH-AM-27029; NAG2-108; DE-AC02-76EV-00119)

The toxicity of alpha-emitting bone-seeking radionuclides and the relationship between bone tumor incidence and the local dosimetry of radionuclides in bone are investigated. The microdistributions of alpha-emitting radionuclides in the trabecular bone from the proximal humerus, distal humerus, proximal ulna, proximal femur, and distal femur of six young adult beagles injected with Am-241 (three with 2.8 micro-Ci/kg and three with 0.9 micro-Ci/kg) are estimated using a computer-controlled microscope photometer system; the components of the University of Utah Optical Track Scanner are described. The morphometric parameters for the beagles are calculated and analyzed. It is observed that the beagles injected with 0.9 micro-Ci of Am-241/kg showed an increase in the percentage of bone and trabecular bone thickness, and a reduction in the width of the bone marrow space and surface/volume ratio. The data reveal that radiation damage causes abnormal bone structure. I.F.

A87-27325* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
IMMOBILIZATION-ASSOCIATED OSTEOPOROSIS IN PRIMATES
D. R. YOUNG (NASA, Ames Research Center, Moffett Field, CA), W. J. NIKLOWITZ, R. J. BROWN (San Francisco, University, CA), and W. S. S. JEE (Utah, University, Salt Lake City) Bone (ISSN 8756-3282), vol. 7, 1986, p. 109-117. refs
(Contract NCC2-135; NAG2-108)

Osteopenic changes in the tibial compact bone of fifteen adult male monkeys immobilized for up to 7 months are examined histologically. Osteonal formation in the proximal tibia is analyzed. The analysis reveals the loss of haversian bone in the proximal tibia, increased activation with excessive depth of penetration of osteoclastic activity, rapid bone loss, and resorption cavities of irregular size and orientation. Osteonal formation following reambulation is examined; the recovery of cortical is a repair and rejuvenation process characterized by refilling of resorption cavities and remodeling activities. I.F.

A87-27399* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HALOBACTERIAL ADENOSINE TRIPHOSPHATASES AND THE ADENOSINE TRIPHOSPHATASE FROM HALOBACTERIUM SACCHAROVORUM
HORDUR KRISTJANSSON, MARTHA H. SADLER, and LAWRENCE I. HOCHSTEIN (NASA, Ames Research Center, Moffett Field, CA) FEMS Microbiology Reviews (ISSN 0168-6445), vol. 39, 1986, p. 151-157. refs

Membranes prepared from various members of the genus Halobacterium contained a Triton X-l00 activated adenosine triphosphatase. The enzyme from Halobacterium saccharovorum was unstable in solutions of low ionic strength and maximally active in the presence of 3.5 M NaCl. A variety of nucleotide triphosphates was hydrolyzed. MgADP, the product of ATP hydrolysis, was not hydrolyzed and was a competitive inhibitor with respect to MgATP. The enzyme from H. saccharovorum was composed of at least 2 and possibly 4 subunits. The 83-kDa and 60-kDa subunits represented about 90 percent of total protein. The 60-kDa subunit reacted with dicyclohexyl-carbodiimide when inhibition was carried out in an acidic medium. The enzyme from H. saccharovorum, possesses properties of an F(1)F(0) as well as an E(1)E(2) ATPase. Author

N87-17762*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EXOBIOLOGY ISSUES AND EXPERIMENTS AT A MARS BASE
CHRISTOPHER P. MCKAY *In* NASA. Marshall Space Flight Center Manned Mars Mission. Working Group Papers, V. 2, Sect. 5, App. p 510 - 518 May 1986
Avail: NTIS HC A24/MF A01 CSCL 06C

Research in Exobiology, the study of the origin, evolution, and distribution of life in the universe, may be a major component of the science activities at a Mars Base. Exobiology activities would include: continuing the search for life on Mars; searching for evidence for ancient life from a warmer Martian past; research into the chemistry of the biogenic elements and their compounds; and other related activities. Mars provides an opportunity in Exobiology, both for immediate study and for long range and possibly large scale experimentation in planetary biology. Author

N87-18201# Karlsruhe Univ. (West Germany). Inst. of Plant Physiology.
LASER-INDUCED CHLOROPHYLL FLUORESCENCE OF LIVING PLANTS
H. K. LICHTENTHALER *In* ESA Proceedings of the 1986 International Geoscience and Remote Sensing Symposium (IGARSS '86) on Remote Sensing: Today's Solutions for Tomorrow's Information Needs, Volume 3 p 1571-1579 Aug. 1986
Avail: NTIS HC A21/MF A01; ESA, Paris, France, 3 volume set $90 Member States, AU, CN, and NO (+20% others)

The principles of in vivo chlorophyll fluorescence (excitation, spectral characteristics, induction kinetics, Kautsky effect, intensity) are summarized and examples of the change in chlorophyll fluorescence parameters due to development, chlorophyll content, herbicide action and stress are given. The ratio of fluorescence decrease to steady state fluorescence is established as a rapid nondestructive method to study the vitality of leaves and needles in ecophysiological field research and in ground truth measurements. It is an excellent tool to study the physiological condition of plants, to document stress effects, and the regeneration of photosynthesis. With respect to the differences in chlorophyll fluorescence signatures between healthy and damaged or stressed plants and trees, it is feasible and technically possible to develop a fluorosensor for remote sensing of the vegetation. ESA

N87-18202# Stuttgart Univ. (West Germany). Dept. of Bioenergetics.
LASER-INDUCED FLUORESCENCE OF PLANTS AND ITS APPLICATION IN ENVIRONMENTAL RESEARCH
R. J. STRASSER *In* ESA Proceedings of the 1986 International Geoscience and Remote Sensing Symposium (IGARSS '86) on Remote Sensing: Today's Solutions for Tomorrow's Information Needs, Volume 3 p 1581-1585 Aug. 1986
Avail: NTIS HC A21/MF A01; ESA, Paris, France, 3 volume set $90 Member States, AU, CN, and NO (+20% others)

Remote sensing of fluorescence to analyze extensive areas of biotopes is discussed. The problems are: undefined and unstable environmental conditions; heterogeneity of the plant material; and difficulty in applying concepts of the photosynthetic apparatus to whole plant areas. It is proposed to consider the whole biotope as one unit which shows an energy uptake J and a biological activity. The whole biotope unit may be characterized by an overall constant K. A steady state flux goes through the system. The actual position of this steady state level B determines the behavior of the system. The J-K-B-Trilogy concept can be used as a tool for remote sensing techniques to describe the dynamics of a system (as variation in B) and real conformational changes (as variation in K) as well as to correlate these changes with variations in the environmental conditions. ESA

N87-18203# Karlsruhe Univ. (West Germany). Inst. of Plant Physiology.
APPLICATION OF LASER-INDUCED CHLOROPHYLL-A FLUORESCENCE IN FOREST DECLINE RESEARCH
G. SCHMUCK and H. K. LICHTENTHALER *In* ESA Proceedings of the 1986 International Geoscience and Remote Sensing Symposium (IGARSS '86) on Remote Sensing: Today's Solutions for Tomorrow's Information Needs, Volume 3 p 1587-1590 Aug. 1986 Sponsored by Projekt Europaeisches Forschungszentrum fuer Massnahmen zur Luftreinhaltung
Avail: NTIS HC A21/MF A01; ESA, Paris, France, 3 volume set $90 Member States, AU, CN, and NO (+20% others)

The determination of the in vivo-chlorophyll fluorescence kinetics to judge the photosynthetic activity of healthy and damaged needle tissue is discussed. At high photosynthetic rates in vivo-chlorophyll fluorescence is low; under stress conditions chlorophyll fluorescence rises parallel to the decline of photosynthesis and to the degree of damage to the photosynthetic apparatus. From the laser-induced fluorescence induction kinetics, determined with a portable field instrument, the damage degree can be quantified by the fluorescence decrease ratio Rfd, which is a direct measure of the potential photosynthetic activity. This allows the identification of the degree of damage to trees. Damaged trees possess fewer needles/leaves, and the photosynthetic rates of their leaves are also lower as seen from lower Rfd-values than in healthy trees. Chlorophyll fluorescence measurements can also be applied to the detection of forest dieback by remote sensing. ESA

N87-18204*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LASER-INDUCED FLUORESCENCE (LIF) FROM PLANT FOLIAGE
E. W. CHAPPELLE and D. L. WILLIAMS *In* ESA Proceedings of the 1986 International Geoscience and Remote Sensing Symposium (IGARSS '86) on Remote Sensing: Today's Solutions for Tomorrow's Information Needs, Volume 3 p 1591-1598 Aug. 1986
Avail: NTIS HC A21/MF A01; ESA, Paris, France, 3 volume set $90 Member States, AU, CN, and NO (+20% others) CSCL 06C

The fluorescence spectra and fluorescence induction kinetics of green plants excited at 337 nm by a laser were studied. They correlate with plant type, as well as with changes in the physiology of the plant as the result of stress. The plant types studied include herbaceous dicots, monocots, hardwoods, conifers, and algae. These plant types could be identified on the basis of differences in either the number of fluorescent bands or the relative intensity of the bands. Differences in fluorescent spectra which could be related to vigor status are observed in conifers located in an area of high atmospheric deposition. Changes in the fluorescence spectra and induction kinetics are also seen in plants grown under conditions of nutrient deficiency and drought stress. ESA

N87-18205*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LASER AND SUNLIGHT-INDUCED FLUORESCENCE FROM CHLOROPHYLL PIGMENTS
H. H. KIM and K. S. BROWN *In* ESA Proceedings of the 1986 International Geoscience and Remote Sensing Symposium (IGARSS '86) on Remote Sensing: Today's Solutions for Tomorrow's Information Needs, Volume 3 p 1599-1601 Aug. 1986
Avail: NTIS HC A21/MF A01; ESA, Paris, France, 3 volume set $90 Member States, AU, CN, and NO (+20% others) CSCL 06C

Fluorescence properties of chlorophyll pigment bearing plant foliage utilizing a 337 nm nitrogen laser and integrating sphere were studied. Measured yields, in terms of number of photons emitted per 100 photons absorbed, range from 1.5 to 0.1 for the 685 nm peak, and from 4.2 to 0.2 for the 730 nm peak. Decreasing order of magnitude puts herbaceous leaves ahead of all others followed by broad leaves of hardwoods and coniferous needles. Meaningful quantization for the fluorescence peaks at 430 and 530 nm could not be attained. Passive monitoring of these fluorescence peaks is successful only for the 685 nm from the ocean surface. Field data show the reflectance changes at 685 nm due to the algae presence amounts to 1% at most. ESA

N87-18206# Oldenburg Univ. (West Germany).
PHOTOINHIBITION OF CHLOROPHYLL-A FLUORESCENCE AND ITS INFLUENCE TO REMOTE SENSING TECHNIQUES
K. P. GUENTHER *In* ESA Proceedings of the 1986 International Geoscience and Remote Sensing Symposium (IGARSS '86) on Remote Sensing: Today's Solutions for Tomorrow's Information Needs, Volume 3 p 1603-1607 Aug. 1986
Avail: NTIS HC A21/MF A01; ESA, Paris, France, 3 volume set $90 Member States, AU, CN, and NO (+20% others)

Remote sensing of laser and solar stimulated fluorescence of chlorophyll a is evaluated, taking into account a variable in vivo fluorescence efficiency. The calculations are based on the expanded bipartite model where the fluorescence efficiency is assumed to depend on the photosynthetic active radiaton. The results concerning laser remote sensing show that the depth

integrated fluorescence lidar signals measured under daylight conditions are reduced compared to night. Additional depth resolved fluorescence signals received during day operation would show a time decay quite different from night operation. ESA

N87-18207# Oldenburg Univ. (West Germany).
LASER-INDUCED CHLOROPHYLL-A FLUORESCENCE OF TERRESTRIAL PLANTS
R. ZIMMERMANN and K. P. GUENTHER *In* ESA Proceedings of the 1986 International Geoscience and Remote Sensing Symposium (IGARSS '86) on Remote Sensing: Today's Solutions for Tomorrow's Information Needs, Volume 3 p 1609-1613 Aug. 1986
Avail: NTIS HC A21/MF A01; ESA, Paris, France, 3 volume set $90 Member States, AU, CN, and NO (+20% others)

A modified oceanographic lidar system operating over forest regions detected the chlorophyll A fluorescence at 685 nm and 735 nm. Inspecting the fuorescence signal ratio along the flight lines confirms that the fluorescence ratio reflects the physiological state of the plant. Results correspond to the evaluation of multispectral scanner data and terrestrial investigation. ESA

N87-18208# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
REMOTE SENSING EXPERIMENT: ADRIA 1984: A COMPARISON OF PASSIVE AND LASER-INDUCED CHLOROPHYLL-FLUORESCENCE
V. AMANN, K. P. GUENTHER (Oldenburg Univ., West Germany), and P. SCHLITTENHARDT (Joint Research Centre of the European Communities, Ispra, Italy) *In* ESA Proceedings of the 1986 International Geoscience and Remote Sensing Symposium (IGARSS '86) on Remote Sensing: Today's Solutions for Tomorrow's Information Needs, Volume 3 p 1615-1620 Aug. 1986
Avail: NTIS HC A21/MF A01; ESA, Paris, France, 3 volume set $90 Member States, AU, CN, and NO (+20% others)

Simultaneous mesurements of chlorophyll concentration were made with an airborne lidar system and an airborne radiometer over the Northern Adriatic Sea in August. Results are compared with in-situ measurements. The results confirm the potential use of airborne chlorophyll fluorescence sensors for identification of chlorophyll concentration in the Northern Adriatic Sea. ESA

N87-18300*# National Aeronautics and Space Administration, Washington, D.C.
THE 1985-86 NASA SPACE/GRAVITATIONAL BIOLOGY ACCOMPLISHMENTS
Feb. 1987 176 p Prepared in cooperation with George Washington Univ., Washington, D.C.
(Contract NASW-3165)
(NASA-TM-89809; NAS 1.15:89809) Avail: NTIS HC A09/MF A01 CSCL 06C

Individual Technical summaries of research projects of NASA's Space/Gravitational Biology Program are presented. This Program is concerned with using the unique characteristics of the space environment, particularly microgravity, as a tool to advance knowledge in the biological sciences; understanding how gravity has shaped and affected life on Earth; and understanding how the space environment affects both plant and animal species. The summaries for each project include a description of the research, a listing of the accomplishments, an explanation of the significance of the accomplishments, and a list of publications.
Author

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

A87-24101
REFRACTIVE CORNEAL SURGERY AND ITS IMPACTS ON THE VISUAL APTITUDE OF PILOTS [LA CHIRURGIE REFRACTIVE DE LA CORNEE ET SES INCIDENCES SUR L'APTITUDE VISUELLE DU PERSONNEL NAVIGANT]
P. MANENT (Centre Principal d'Expertise Medicale du Personnel Navigant, Paris, France) and J. C. BALLION (Hopital d'Instruction des Armees R. Picque, Bordeaux, France) Medecine Aeronautique et Spatiale, vol. 25, 3rd Quarter, 1986, p. 199-204. In French.

Refractory corneal surgical techniques are described, along with the impacts of the operations on the flight fitness of two myopic pilots. In myopia, the curvature of cornea, the length of the eye, and the refractive power of the cornea act to focus incoming light on a spot before the retina, thereby lowering visual acuity. One type of surgery seeks to alleviate the problem by radial incisions around the cornea to permit a flattening effect to occur. A second technique rearranges the corneal tissue by grafting techniques guided by computer modeling of the shape the cornea needs to regain normal vision. The results of the two operations on pilots, one regaining and the other losing flight fitness certification, are detailed. Factors influencing the decision on whether or not to operate and which technique to use are discussed. M.S.K.

A87-24102
CRYSTALLINE IMPLANTS AND THE VISUAL APTITUDE OF PILOTS [LES IMPLANTS CRISTALLINIENS ET L'APTITUDE VISUELLE DU PERSONNEL NAVIGANT]
C. CORBE, M. MAILLE, and P. JACQUIOT (Centre Principal d'Expertise Medicale du Personnel Navigant, Paris, France) Medecine Aeronautique et Spatiale, vol. 25, 3rd Quarter, 1986, p. 204-206. In French.

The various types of corrective measures available to correct for the formation of cataracts are reviewed, with emphasis on the surgical implantation of lenses and the impact on the flight fitness of pilots. Attention is given to the limitations of glasses and contact lenses, and to the anterior chamber, pupillary, and posterior implantation of artifical lenses. Problems arising from the lack of regenerative powers in the epithelium, the mechanical stresses are imposed on the incised tissue immediately after surgery, and the shape of the eye in the regions where operations are possible are discussed. Although several methods have been devised to implant lenses in ways which will allow for the stresses imposed on the implants during flight, pilots who undergo corrective surgery will in almost all cases be declared unfit for flight duty. M.S.K.

A87-24103
MIDDLE EAR SURGERY AND ITS IMPACTS ON THE FLIGHT FITNESS OF PILOTS [LA CHIRURGIE DE L'OREILLE MOYENNE ET SES INCIDENCES SUR L'APTITUDE DU PERSONNEL NAVIGANT]
P. NARCY (Hopital Bretonneau, Paris, France) and P. CONTENCIN Medecine Aeronautique et Spatiale, vol. 25, 3rd Quarter, 1986, p. 208-210. In French.

The various diseases and dysfunctions to which the human middle ear is subject are reviewed, along with appropriate surgical measures and their effects on flight fitness. Techniques for ameliorating blockage of the Eustachian tube, infection and/or keratitis of the tympano-mastoidal cavities, lesions in the tympano-ossicular system and ankylosis of the stirrup platen. Only ankylosis of the stirrup platen is a cause for immediate suspension from flight duty upon discovery. The evolution of the disorder must be monitored after surgery and judged rectified before flight fitness certification is regained. M.S.K.

A87-24104
MEDICINAL TREATMENTS FOR CARDIOVASCULAR BLOCKINGS AND THEIR IMPACT ON FLIGHT FITNESS [LES TRAITEMENTS MEDICAMENTEUX DES AFFECTIONS CARDIOVASCULAIRES ET LEUR INCIDENCE SUR L'APTITUDE DU PERSONNEL NAVIGANT]
J. P. BURLATON, J. P. GOURBAT, A. SEIGNEURIC, and A. DIDIER (Hopital d'Instruction des Armees Dominique Larrey, Versailles, France) Medecine Aeronautique et Spatiale, vol. 25, 3rd Quarter, 1986, p. 210-215. In French. refs

The various medications prescribed for cardio-vascular disorders are reviewed with an eye to the compatibility of the medications and flight fitness. Attention is given to eight classes of therapeutic substances, including anticoagulants, vasodilators, diuretics, etc., and to the secondary effects of antihypertensives. A continuing controversy is noted for the use of beta blockers, which are permitted. Currently available beta blocking substances which have either no effects or positive effects on pilot concentration are identified. Finally, medications which are completely incompatible with flight safety are discussed. M.S.K.

A87-24105
PARAMETRIC ENDOCARDIOGRAPHIC STUDIES WITH TWO POPULATIONS OF PILOTS. I - STATISTICAL ANALYSIS [ETUDES DE PARAMETRES ECHOCARDIOGRAPHIQUES OBTENUS CHEZ DEUX POPULATIONS DE PILOTES. I - ANALYSE STATISTIQUE]
P. QUANDIEU, E. VICAUT, B. PIEDECOCQ (Centre de Recherche de Medecine Aeronautique, Paris, France), J. LEFEBVRE, M. BOITARD (Institut National de la Recherche Agronomique, Jouy en Josas, France) et al. Medecine Aeronautique et Spatiale, vol. 25, 3rd Quarter, 1986, p. 219-228. In French.

Multivariate statistical techniques were applied to 11 echocardiographic parameters recorded from 32 fighter pilots and 34 transport aircraft pilots. The variables included the weight, height, body surface, age, cumulative flight hours, the thickness of the arterial walls and the diameters of the cardiac cavities. The analysis concentrated on the homogeneity of the populations and identifying the minimum number of parameters which furnish the maximum amount of data. Weighting coefficients devised to correct for data abnormalities are discussed, along with details of the statistical techniques that were applied. M.S.K.

A87-24106
SOLID MECHANICAL VIBRATIONS. III [LES VIBRATIONS MECANIQUES SOLIDIENNES. III]
J. L. POIRIER Medecine Aeronautique et Spatiale, vol. 25, 3rd Quarter, 1986, p. 229-236. In French. refs

Vibratory phenomena which can affect the health of humans riding in vehicles are discussed, along with available techniques for ameliorating the effects of vibrations. Attention is given to the perception of the vibrations, the types and magnitudes of harm imparted to humans at different vibrational frequencies, and to the physiological areas which are most subject to damage from vibrational loading. The vibrational hazards of land vehicles, helicopters and aircraft are reviewed, together with the use of active and suspended seats for reducing the vibrational load on the pilot, noting the increased chances of harmful effects with the length of time for the specific types of vehicles. Adaptive control systems and pilot posture seats are considered as means to lessening pilot exposure to vibration. M.S.K.

A87-24107
SINUS BAROTRAUMA IN THE AERONAUTICAL ENVIRONMENT. I [DU BARO-TRAUMATISME SINUSIEN EN MILIEU AERONAUTIQUE. I]
J. F. GOUTEYRON (Hopital d'Instruction des Armees Dominique Larrey, Versailles, France) Medecine Aeronautique et Spatiale, vol. 25, 3rd Quarter, 1986, p. 236-244. In French.

Human physiological reactions to sudden losses of atmospheric pressure, i.e., sudden, intense pain, can cause pilots, both civil and military, to lose control of an aircraft. Techniques are defined for examining pilot candidates to identify those who are subject to nasal and/or sinus blockages due to the shape and/or size of the ostia, which permits drainage of mucous and pressure equalization between sinus and nasal cavities. Clinical symptoms which signify the onset of sinus barotrauma are described and diagnostic tests are discussed for discerning patients with sinus problems from those with other ailments which cause the same symptoms. Anatomical characteristics of the first, second and third stages of sinus barotrauma, beginning with simple blockage and ending with edema of the sinus cavity, are detailed. M.S.K.

A87-24108
ASTHMA AND AIRCREW [ASTHME ET PERSONNEL NAVIGANT]
G. LEGUAY and J. DRONIOU (Hopital d'Instruction des Armees Dominique Larrey, Versailles, France) Medecine Aeronautique et Spatiale, vol. 25, 3rd Quarter, 1986, p. 244-248. In French. refs

The physiological basis and symptoms of asthma are reviewed with an eye to the compatibility of asthma sufferers and flight safety. It has long been known that higher altitudes are therapeutic for asthma, as are repeated sessions cycling in a hypobaric chamber. The precipitating causes of asthmatic bronchial obstruction are identified, along with statistics of the age-related occurrence of asthma, which show that although only 50 percent of the persons who exhibit asthma as babies have symptoms in young adulthood, 70 percent will have symptoms after the age of 40. Techniques are defined for clinical monitoring of pilots who are susceptible to asthma attacks. It is noted that pilots of combat aircraft routinely experience high-g accelerations which induce symptoms that are similar to asthma attacks. M.S.K.

A87-24109
SYMPTOMS OF KINETOSIS: SIMULATOR SICKNESS - THE RELATIONSHIP TO SENSORIAL ILLUSIONS [UN ASPECT ACTUEL DES CINETOSES: LE MAL DES SIMULATEURS RELATION AVEC LES ILLUSIONS SENSORIELLES]
A. LEGER (Centre d'Essais en Vol, Bretigny sur Orge, France) Medecine Aeronautique et Spatiale, vol. 25, 3rd Quarter, 1986, p. 248-253. In French. refs

Since fully realistic motions cannot be provided in a flight simulator, sensorial illusions are used as a compensation to heighten the realism. It is known that the inertial movement of the head in the terrestrial frame of reference or the visual perception of motion will excite certain responses in the central nervous system. However, a lack of correspondence between visual and physical motions can cause response conflicts, producing the classic symptoms of nausea, ocular tension, dizziness and vertigo. The symptoms can appear in all flight simulators. Various prophylactic and in-session and techniques for avoiding the occurrence of simulator sickness are delineated. M.S.K.

A87-24142
NONTHERMOREGULATORY CONTROL OF HUMAN SKIN BLOOD FLOW
JOHN M. JOHNSON (University of Texas Health Science Center, San Antonio) Journal of Applied Physiology (ISSN 0161-7567), vol. 61, Nov. 1986, p. 1613-1622. refs
(Contract NIH-HL-20663)

The effects of baroreceptor-mediated reflexes or reflexes associated with exercise on the control of skin blood flow are investigated. The relations between baroreceptor control of cutaneous circulation and temperature, postural changes, and exercise are examined. It is observed that the baroreceptor reflexes reduce sympathetic vasoconstrictor outflow to the vasculature. The vasoconstrictor effect of exercise on skin blood flow is described; exercise reduces the response in skin blood flow to elevate internal temperature. Consideration is given to efferent control and vasoconstriction. The data reveal that the reflexes cause shifts in the threshold internal temperature at which cutaneous vasodilation begins. I.F.

A87-24143* Technion - Israel Inst. of Tech., Haifa.
EFFECT OF WATER IMMERSION ON CARDIOPULMONARY PHYSIOLOGY AT HIGH GRAVITY (+GZ)
R. ARIELI, U. BOUTELLIER, and L. E. FARHI (Technion-Israel Institute of Technology, Haifa; New York, State University, Buffalo) Journal of Applied Physiology (ISSN 0161-7567), vol. 61, Nov. 1986, p. 1686-1692. refs
(Contract NAS9-16042)

The cardiopulmonary responses of eight male subject between 21-31 years exposed to 1, 2, and 3 Gz during immersion at 35 + or - 0.5 C to heart level and during control dry rides are studied. Ventilation, O2 consumption, the end-tidal pressure of CO2, heart frequency, cardiac output, functional residual capacity, and the arterial pressure of CO2 were measured. It is observed that as Gz increases ventilation, heart frequency, and O2 consumption increase, and the end-tidal and arterial pressures of CO2 decrease during dry rides, but are not altered during immersion. It is detected that the functional residual capacity is lower during immersion and decreases in both the dry and immersed state as Gz increases, and cardiac output decreases as Gz increases in dry rides. It is noted that changes produced by acceleration in a Gz direction are due to the effect on the systemic circulation rather than to the effect on the lungs. I.F.

A87-24144
PULMONARY GAS EXCHANGE IN HUMANS DURING NORMOBARIC HYPOXIC EXERCISE
M. D. HAMMOND, G. E. GALE, K. S. KAPITAN, A. RIES, and P. D. WAGNER (California, University, San Diego) Journal of Applied Physiology (ISSN 0161-7567), vol. 61, Nov. 1986, p. 1749-1757. refs
(Contract NIH-HL-17731; NIH-RR-00827)

Gas exchange during exercise under normobaric hypoxia for ten male subjects are compared with hypobaric measurements using the multiple inert gas elimination technique. The expired minute ventilation, cardiac output, arterial blood, and mixed expired respiratory and inert gas samples following various work loads were evaluated; the work loads and analysis techniques are described. The effects of ventilation-perfusion inequality and O2 diffusion limitation on alveolar arterial O2 tension difference during exercise are examined. It is observed that there is an increase in the ventilation-perfusion inequality with an increase in O2 consumption during normobaric and hypobaric hypoxia exercises and the rate of increase in dispersion with respect to O2 consumption is comparable under both conditions. Various mechanisms that may cause the increase in ventilation-perfusion inequality are proposed. I.F.

A87-24145
EFFECTS OF ADENOSINE ON VENTILATORY RESPONSES TO HYPOXIA AND HYPERCAPNIA IN HUMANS
D. L. MAXWELL, R. W. FULLER, K. B. NOLOP, C. M. S. DIXON, and J. M. B. HUGHES (Royal Postgraduate Medical School; Hammersmith Hospital, London, England) Journal of Applied Physiology (ISSN 0161-7567), vol. 61, Nov. 1986, p. 1762-1766. Research supported by the Wellcome Trust, Medical Research Council and American Heart Association. refs

The effects of adenosine infused at a level of 70-80 microns/kg per min on the ventilatory response to hypoxia and hypercapnia of six male subjects between 29-48 years are investigated. The resting ventilation and progressive ventilatory responses to isocapnic hypoxia and hyperoxic hypercapnia, blood pressure, and heart rate were measured. It is observed that adenosine causes an increase in resting minute ventilation, lowers the resting end-tidal pressure of CO2, increases heart rate without changing systemic blood pressure, and increases the hypoxic ventilatory response without altering the hypercapnic response. The data reveal that adenosine stimulates ventilation by a peripheral action. I.F.

A87-24146* Beth Israel Hospital, Boston, Mass.
ATROPINE UNMASKS BED-REST EFFECT - A SPECTRAL ANALYSIS OF CARDIAC INTERBEAT INTERVALS
ARY L. GOLDBERGER (Beth Israel Hospital, Boston, MA), DANIELLE GOLDWATER (NASA, Ames Research Center, Moffett Field, CA), and VALMIK BHARGAVA (USVA Medical Center; California, University, San Diego, CA) Journal of Applied Physiology (ISSN 0161-7567), vol. 61, Nov. 1986, p. 1843-1848. refs

Heart rate spectral data obtained for 10 male subjects between 35-49 years following orthostatic tolerance testing with lower body negative pressure prebed rest and after 7-10 days of bed rest, while on placebo and after intravenous atropine are analyzed. Comparison of the spectral atropine rms for subjects prebed rest and after bed rest reveal a decrease from 63 + or - 24 ms to 40 + or - 23 ms. It is observed that heart rate interval variability for subjects after bed rest and with atropine is reduced; the heart rate at bed rest with atropine is increased from 70.4 + or - 12.4 beats/min prebed rest to 83.7 + or - 18.9 beats/min; and the exercise tolerance time for subjects in the atropine prebed-rest phase (658 + or - 352 s) is higher than the bed-rest phase (505 + or - 252 s). It is noted that bed rest impairs the cardiovascular capacity to adaptively modulate physiological responses, atropine exposes bed-rest deconditioning effects, and spectral analysis is useful for studying the effects of bed-rest deconditioning on cardiac dynamics. I.F.

A87-24147
DISTORTION OF CALCULATED WHOLE-BODY HEMATOCRIT DURING LOWER-BODY IMMERSION IN WATER
DOUGLAS R. KNIGHT, THOMAS SANTORO, and KENNETH BONDI, R. (U.S. Navy, Naval Submarine Medical Research Laboratory, Groton, CT) Journal of Applied Physiology (ISSN 0161-7567), vol. 61, Nov. 1986, p. 1885-1890. Navy-supported research. refs

A87-24150
PROPRANOLOL DOES NOT IMPAIR EXERCISE OXYGEN UPTAKE IN NORMAL MEN AT HIGH ALTITUDE
LORNA G. MOORE, ALLEN CYMERMAN, SHAO-YUNG HUANG, ROBERT E. MCCULLOUGH, ROSANN G. MCCULLOUGH (Colorado, University, Denver and Boulder; U.S. Army, Research Institute of Environmental Medicine, Natick, MA; Shanghai Institute of Physiology, People's Republic of China) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 61, Nov. 1986, p. 1935-1941. refs
(Contract NIH-HL-14985; NIH-HD-00681; NIH-HL-07171; DAMD17-85-C-5205)

The effects of propranolol on the cardiorespiratory responses of 12 males age 19-23 years during maximal and submaximal exercise at sea level and on Pikes Peak (4300 m) are investigated. The O2 uptake, heart rate, ventilation, and arterial O2 saturation for placebo and propranolol (240 mg/24 hrs) test groups were measured and compared. It is observed that the beta-adrenergic blockade did not affect maximal or submaximal exercise performance at high altitude, propranolol caused a decrease in the heart rate at Pikes Peak, and the maximal and submaximal levels of O2 uptake in propranolol-treated subjects are maintained. I.F.

A87-24750* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DEXAMETHASONE MIMICKS THE ANTIMOTION SICKNESS EFFECTS OF AMPHETAMINE AND SCOPOLAMINE
RANDALL LEE KOHL (NASA, Johnson Space Center, Houston, TX) Acta Astronautica (ISSN 0094-5765), vol. 13, Sept. 1986, p. 565-571. refs

Based on preliminary suggestions that individual differences in susceptibility to stressful motion might be related to physiological differences in responses of the hypothalamic-pituitary-adrenal axis, the efficacy of dexamethasone and metyrapone is tested in subjects exposed to cross-coupled accelerative semicircular canal stimulation on a rotating chair. Subjects given 0.5 mg of

dexamethasone every 6 h for 48 h could endure 80 percent more stressful motion (P = 0.03) in a within-subjects design study, whereas, no improvement followed treatment with 750 mg of metryapone every 4 h for 24 h. The efficacy of dexamethasone might be explained in terms of its neurochemical actions on several neurotransmitter systems which are also modulated by such classical antimotion sickness drugs as amphetamine and scopolamine. Because dexamethasone induces adaptive changes within the central nervous system it may prove superior to scopolamine and amphetamine which possess significant side effects, are short acting, and rapidly tolerated. Author

A87-25109
THE ACID-BASE STATE AND GAS COMPOSITION OF BLOOD OF RESIDENTS OF THE NORTHEASTERN USSR [KISLOTNO-SHCHELOCHNOE SOSTOIANIE I GAZOVYI SOSTAV KROVI ZHITELEI SEVERO-VOSTOKA SSSR]

L. N. MATVEEV (Moskovskii Meditsinskii Stomatologicheskii Institut, Moscow, USSR) and A. G. MARACHEV (Institut Morfologii Cheloveka, Moscow, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, July-Aug. 1986, p. 575-580. In Russian. refs

The acid-base contents and partial pressures of O2 (pO2) and CO2 (pCO2) in blood of newcomers to and natives of Magadan and Anadyr' in the northeastern USSR were compared with the respective values of Moscow residents. Compared with the residents of Moscow, newcomers to Magadan (but not its natives) exhibited considerable blood alkalosis and decreased pCO2, while both the newcomers to Anadyr' and its natives exhibited higher levels of blood acidosis and signs of metabolic acidosis. The values of pO2 in the venous blood were higher in all newcomers to the northeast, while the percent of hemoglogin saturation was lower. The hemoglobin/oxygen correlation in the natives had the opposite character. The changes observed in newcomers are considered to indicate adaptive increases in the efficiency of tissue oxygenation, while the differences observed between the residents of Magadan and Anadyr' are explained by the higher geographical latitude of the latter. I.S.

A87-25110
PREDICTING THE HEALTH CONDITION OF MIDDLE-AGED PERSONS FROM RESULTS OF HEMODYNAMIC REACTIONS TO PHYSICAL LOADS [PROGNOZ SOSTOIANIIA ZDOROV'IA U LITS POZHILOGO VOZRASTA PO DANNYM GEMODINAMICHESKOGO REAGIROVANIIA NA FIZICHESKUIU NAGRUZKU]

K. V. GAVRIKOV and L. A. SAVINA (Volgogradskii Meditsinskii Institut, Volgograd, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, July-Aug. 1986, p. 581-584. In Russian. refs

Hemodynamic reactions to minimal physical loads (bicycle ergometer exercises in horizontal position) were measured in middle-aged (up to 75 years) healthy persons, as well as in subjects suffering from cardiovascular abnormalities, correlating the results with the health status of the subjects. Among the physiological parameters measured, the type of stroke volume dynamics was found to be the most valuable index. It was found that the subjects with normal and stable increases (up to 25 percent of the value at rest) of stroke volume remained most healthy during the study period (which varied from 5 to 15 years). The hyporesponding type usually coincided with the presence of progressing cardiovascular abnormalities. A change in the type of response, especially from a hyperreacting to a hyporeacting response, and vice versa, indicated the most considerable worsening of the health status (with lethal outcome reaching 50 percent). I.S.

A87-25111
REACTIONS OF THE CARDIOPULMONARY SYSTEM ON LOW-POWER INFRARED LASER IRRADIATION OF ISOLATED SKIN AREAS OF THE HAND [REAKTSII KARDIORESPIRATORNOI SISTEMY NA INFRAKRASNOE LAZERNOE OBLUCHENIE MALOI MOSHCHNOSTI LOKAL'NYKH UCHASTKOV KOZHI KISTI RUKI]

V. I. SELEZNEV, S. V. GUSKOV, T. S. KILINA, and V. M. BELIAKOV (Nauchno-Issledovatel'skii Institut Normal'noi Fiziologii, Moscow, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, July-Aug. 1986, p. 595-600. In Russian. refs

The stimulating effect of low-power (0.5 mW) irradiation of isolated skin areas on a subject's hands by an IR laser on the cardiopulmonary system was studied, using subjects of different age, sex, and occupation groups. Among the physiological indices that were found to change as a result of irradiation, the absolute values and the dynamic changes of the integral efficiency index, defined as the ratio of the mean arterial pressure to the oxygen deficit in exhaled air, were found to be most informative. The results obtained on older nonathletic subjects suggest that, in subjects with lowered aerobic reserves, the biostimulating effect of laser irradiation can promote normalization of cardiopulmonary system functions. I.S.

A87-25112
VASCULAR RESPONSES UNDER THE EFFECT OF COLD IN MOUNTAIN CLIMBERS WHO ARE CANDIDATES TO AN EVEREST EXPEDITION TEAM [SOSUDISTYE REAKTSII PRE KHOLODOVYKH VOZDEISTVIIAKH U AL'PINISTOV-KANDIDATOV V SOSTAV EKSPEDITSII NA EVEREST]

N. E. PANFEROVA, T. A. KABESHEVA, and E. B. GIPPENREITER Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, July-Aug. 1986, p. 601-607. In Russian. refs

A87-25113
THE EFFECTS OF DIFFERENT TYPES OF HYPERTHERMIA ON WORK CAPACITY [VLIIANIE RAZLICHNYKH VIDOV GIPERTERMII NA RABOTOSPOSOBNOST']

A. S. PAVLOV (Voroshilovgradskii Mashinostroitel'nyi Institut, Voroshilovgrad, Ukrainian SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, July-Aug. 1986, p. 608-614. In Russian. refs

The effects of gradual increases of body temperature (up to 39-40 C), caused by performing either light physical activity in hot environments (endogenous hyperthermia) or heavy work in a comfortable environment (exogenous hyperthermia), on work capacity were studied in athletes and young healthy nonathletes. The work capacity was evaluated using international standards of physical fitness. Significant exogenous hyperthermia was found to decrease work capacity, but more so in physically untrained subjects. On the other hand, endogenous hyperthermia increased maximal work capacity, both in physical tests which measured strength, speed, dexterity, and flexibility, and in the tests which evaluated mental work capacity. However, during the physical endurance tests, both exogenous and endogenous hyperthermias lowered work capacity in all subjects. I.S.

A87-25114
A SIMPLIFIED MODEL OF HEAT EXCHANGE [UPROSHCHENNAIA MODEL' TEPLOOBMENA]

L. M. POLESSKAIA, V. S. VANGELI, and M. D. GODOROZIA (Moldavskii Nauchno-Issledovatel'skii Institut Gigieny i Epidemiologii, Kishinev, Moldavian SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, July-Aug. 1986, p. 615-620. In Russian. refs

A simple model of heat exchange in the human body is presented, which takes into account the regulating role of the central nervous system. In the model, the body is considered as a single unit not separated into parts; the model parameters of oxygen consumption and pulmonary ventilation are expressed by dynamic regression equations obtained on the basis of experimental results. The model makes it possible to determine body temperature

and the magnitude of heat loss from its surface during work in uncomfortable environments caused by specified values of ambient temperature, humidity, CO2 concentration, air movement, atmospheric pressure, and thermal clothing index. I.S.

A87-25115
REORGANIZATION OF MICROCIRCULATION IN THE LOWER EXTREMITIES UNDER CONDITIONS OF REGIONAL ORTHOSTATIC HYPERTENSION [PERESTROIKA MIKROTSIRKULIATSII NIZHNIKH KONECHNOSTEI PRI LOKAL'NOI ORTOSTATICHESKOI GIPERTENZII]
V. M. BYKOV (Altaiskii Meditsinskii Institut, Barnaul, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, July-Aug. 1986, p. 621-626. In Russian. refs

The mechanisms responsible for effective compensatory changes in the microcirculatory system of the lower extremities of the human body, caused by regional orthostatic hypertension (brought about by changing the body position from horizontal to vertical), were investigated. The techniques used to evaluate changes in the blood flow included photoplethismography, capillaroscopy, and the use of I-131 (for estimation of capillary clearance); the capillary blood pressure was evaluated by measuring intraosseous pressure; and the O2 and CO2 pressures were measured by the methods described by Astrup et al. (1960). The onset of orthostatic hypertension was found to be accompanied by compensatory increases in the tonus of the vessels of the feet and toes and by a significant slowdown of tissue blood flow. The decrease of the blood flow was in turn compensated for by an increase in the rate of regional oxygen uptake. I.S.

A87-25116
THE EFFECT OF IMMERSION HYPOKINESIA ON CHARACTERISTICS OF THE RHYTHMIC ACTIVITY OF SOLEUS MUSCLE MOTOR UNITS [VLIIANIE IMMERSIONNOI GIPOKINEZII NA KHARAKTERISTIKI RITMICHESKOI AKTIVNOSTI DVIGATIEL'NYKH EDINITS KAMBALOVIDNOI MYSHTSY]
A. V. KIRENSKAIA, I. B. KOZLOVSKAIA, and M. G. SIROTA Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, July-Aug. 1986, p. 627-632. In Russian. refs

The effect of five-day immersion on the rhythmic activity of motor units (MUs) in the soleus muscle was investigated, measuring the MU activity while the isometric tonic tension of the muscle was maintained. The results of measuring the impulse activity of the MUs before immersion and on the 3rd and 5th days of immersion have indicated significant changes in the bioelectric activity characteristics. These changes included increased variance in the interimpulse intervals, increased percent of MUs with synchronized activity, and lenghtening of the interimpulse intervals. The rapidity of the development of these changes indicated their reflectorial nature. I.S.

A87-25117
EVOKED CORTICAL POTENTIALS IN HUMANS IN RESPONSE TO VERTICAL THRESHOLD ACCELERATIONS [VYZVANNYE KORKOVYE POTENTSIALY NA VERTIKAL'NYE POROGOVYE USKORENIIA U CHELOVEKA]
E. IU. SLAVINSKII and K. F. TRINUS (Kievskii Nauchno-Issledovatel'skii Institut Otolaringologii, Kiev, Ukrainian SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, July-Aug. 1986, p. 651-656. In Russian. refs

The informative characteristics of the cortical evoked potentials (EPs) in response to threshold vertical linear accelerations were investigated, using subjects seated in a movable chair with closed eyes. Threshold accelerations were determined by applying vertical accelerations to the chair until the subject perceived the fact of the movement, at which time the EPs were determined. The results have shown that determination of the threshold EPs can be used as a method for finding the stimulation threshold of the vestibular analyzer; the 6-Hz component in the EP spectrum may be related to the processes in the conducting path, while the 4-Hz component may reflect the subjective perception of vestibular sensations. I.S.

A87-25118
EVALUATION OF AN OPERATOR'S FUNCTIONAL STATUS UNDER THE CONDITIONS OF SENSORY DEFICIT [OTSENKA FUNKTSIONAL'NOGO SOSTOIANIIA OPERATORA V USLOVIIAKH SENSORNOGO DEFITSITA]
B. M. BAEVSKII and T. D. SEMENOVA Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, July-Aug. 1986, p. 676-678. In Russian. refs

The type of activity that involves anticipation of a signal or a command takes place in the conditions of sensory deficit and is accompanied with significant nervous stress. Therefore, the information concerning the state of the vegetative system can serve in determining the work capacity of an operator performing a particular task and in determining the physiological 'prize' of the task. A technique is described for measuring a vegetative balance of an operator, using EKG recordings, which takes into account the individual peculiarities of an operator by introducing a derived index, termed the integral criterion of functional measurements. This technique makes it possible to unify evaluations of functional status performed on different operators. I.S.

A87-25119
REACTIVITY OF THE HUMAN VEGETATIVE NERVOUS SYSTEM FROM DATA OBTAINED ON THE OCULOCARDIAC, CAROTID-SINUS, AND PLANAR REFLEXES [REAKTIVNOST' VEGETATIVNOI NERVNOI SISTEMY CHELOVEKA PO DANNYM GLAZO-SERDECHNOGO, SINO-KAROTIDNOGO I SOLIARNOGO REFLEKSOV]
F. V. OSMININ, A. F. ERSHOV, A. P. PISANKO, V. A. NIBUSH, and V. N. SUNTSOV (Tomskii Gosudarstvennyi Universitet, Tomsk, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, July-Aug. 1986, p. 679-681. In Russian. refs

Statistically-significant norm limits for changes of the heart rate (HR) in measuring the oculocardiac, carotid-sinus, and planar reflexes were obtained, applying standard methods of measurements to 164 young healthy men. A significant difference was found between the norm limits of the oculocardiac and the planar reflexes, namely, a shift of the planar reflex towards sympathicotonia, supporting literature data. Twenty five percent of the subjects exhibited a paradoxical reaction: acceleration (instead of slowing down) of HR upon application of pressure to a reflex zone. I.S.

A87-25171
HEAT EXHAUSTION CAUSED BY BODY DEHYDRATION [TEPLOVOE ISTOSHCHENIE VSLEDSTVIE OBEZVOZHIVANIIA ORGANIZMA]
E. V. GEMBITSKII, G. N. NOVOZHILOV, and S. D. POLOZHENTSEV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), July 1986, p. 25-30. In Russian. refs

Physiological mechanisms responsible for heat exhaustion that accompanies severe dehydration are discussed, along with metabolic changes and morphological alterations seen in the heart, kidney, and liver tissues in cases of severe and/or repeated incidences of heat exhaustion. Consideration is given to clinical symptoms of heat exhaustion, and to the ways of diagnosing the severity of the condition. Methods for calculating the extent of water deficiency are described along with methods for treating and monitoring the patients' condition. Author

A87-25172
DIAGNOSING FATIGUE AND OVERGATIGUE IN FLIGHT PERSONNEL [O DIAGNOSTIKE UTOMLENIIA I PEREUTOMLENIIA LETNOGO SOSTAVA]
V. A. BODROV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), July 1986, p. 46-48. In Russian.

A summary of experimental and literature data on the causes and symptoms of chronic fatigue and exhaustion in flight personnel is presented. Emphasis is placed on the importance of such functional symptoms as insomnia, headaches, lack of appetite, and general weakness, when these symptoms continue for days after the last assignment is completed. Physiological and biochemical changes, as well as clinical symptoms present in

overgatigued subjects are described. Among tests commonly used for diagnosing overfatigue, the most predictive are considered to be the orthostatic stability test, tremor measurements, the index of heart function under load, a test for muscle endurance under static load, and the length of the latent period of a simple sensomotor reaction to a light stimulus. I.S.

A87-25398
THREE THEORIES OF STROBOSCOPIC MOTION DETECTION
GEORGE SPERLING, JAN P. H. VAN SANTEN, and PETER J. BURT (New York University, NY) Spatial Vision (ISSN 0169-1015), vol. 1, no. 1, 1985, p. 47-56. refs
(Contract AF-AFOSR-80-0279)

The three theories derive from three different paradigms. Suprathreshold judgments of perceived quality of motion in multiflash displays are modeled by space-time Fourier analysis of the motion stimulus. Stroboscopic motion is perceived as being different from real motion to the extent that the additional Fourier components in stroboscopic motion are detectable. Stroboscopic motion of dots along conflicting paths leads to perceptual competition. The theory to describe perceptual I solution derives and proves the uniqueness of strength functions computed only from the time and from the distance between successive points on each path. Time-strength and motion-strength add to determine path-strength; only the strongest path is perceived. Motion-direction detection in continuously drifting two-flash combinations of sinusoidal gratings is described by elaborated Reichardt detectors (ERDs) that compute the covariance of temporal events in two adjacent locations. Other, apparently different, detectors that account for direction-detection data are shown to be equivalent to ERDs. Author

A87-25399
SPATIAL PHASE AND FREQUENCY IN MOTION CAPTURE OF RANDOM-DOT PATTERNS
V. S. RAMACHANDRAN and V. INADA (California, University, La Jolla) Spatial Vision (ISSN 0169-1015), vol. 1, no. 1, 1985, p. 57-67. refs

A square matrix of spots (A) was presented in rapid alternation with an uncorrelated matrix (B). If the square arrays are superimposed spatially one sees random incoherent motion. However, incoherent motion was seen only if the outer edges were exactly aligned. If the outline of matrix A is shifted horizontally by 1 deg in relation to B, then the edges are seen to oscillate to and fro. Surprisingly, all the dots in the matrix were seen to 'adhere' to the edges and to move horizontally (Ramachandran, 1981). The edges were then aligned again to produce incoherent motion, and a sine-wave grating was superimposed on the pattern. If the grating was moved horizontally, then all the spots 'adhered' to it and moved horizontally as well. This illusion ('motion capture') was optimal at a 90-deg spatial phase shift of the grating; at low spatial frequencies (less than 0.5 cycles); and when the grating was alternated in step with the dot patterns. Density-modulated gratings were just as effective. It is concluded that the unambiguous motion signal derived from the grating is applied spontaneously to the dots as well. Author

A87-25508
SPATIAL INTEGRATION CHARACTERISTICS IN MOTION DETECTION AND DIRECTION IDENTIFICATION
ANDREI GOREA (Paris V, Universite; Ecole Pratique des Hautes Etudes, Paris, France) Spatial Vision (ISSN 0169-1015), vol. 1, no. 2, 1985, p. 85-102. refs
(Contract CNRS-ATP-955130)

Spatial integration characteristics were assessed with drifting gratings for both detection and direction-identification contrast thresholds. Thresholds were measured while stimulus width, length or both were varied. It was found that: (1) the shape of the size/sensitivity functions changes with spatial, but not with temporal, frequency; (2) direction-identification thresholds diverge from the detection thresholds below 1 cycle but can be reliably measured for stimulus widths as small as 0.1275 cycles; (3) the integration characteristics are slightly anisotropic for the identification but not for the detection process; and (4) the two-dimensional spatial integration cannot be directly predicted from its one-dimensional characteristics. Width/sensitivity detection functions are well fitted by predictions of Wilson and Bergen's four-channel model. Predictions from a temporal covariance model provide a poor fit to the identification data. It is argued that classes of detection and direction-identification models must involve identical nonlinearities prior to their respective thresholds. It is concluded that the hypothesis according to which both performances are determined by the same spatial integration stage cannot be rejected. Author

A87-25509
THE TILT AFTER-EFFECT - CHANGES WITH STIMULUS SIZE AND ECCENTRICITY
J. P. HARRIS and J. E. CALVERT (Bristol, University, England) Spatial Vision (ISSN 0169-1015), vol. 1, no. 2, 1985, p. 113-129. refs

Previous evidence that the tilt after-effect (TAE) is larger when the stimuli are viewed peripherally rather than centrally was confirmed. An increase in viewing distance also increased TAE size. However, the increase in the TAE in peripheral vision was abolished if stimuli were increased in size to compensate for the change in the cortical magnification factor. Both the decrease in field diameter and increase in spatial frequency with viewing distance were found to influence the size of the TAE. When the data were expressed in cortical terms, the TAE was found to increase with spatial frequency, and decrease with field diameter, regardless of retinal position. The functional significance of these effects is discussed. Author

A87-25510
FAST NONINERTIAL SHIFTS OF ATTENTION
DOV SAGI and BELA JULESZ (AT&T Bell Laboratories, Murray Hill, NJ) Spatial Vision (ISSN 0169-1015), vol. 1, no. 2, 1985, p. 141-149. refs

It was suggested that some discrimination tasks (e.g., discrimination between the letters T and L) require serial search by scrutinizing each letter (target) with a small aperture of focal attention. The paper examines the effect of intertarget distance on discrimination performance, using two targets. A reduction in performance at short distances is found which is in agreement with masking studies. Constant performance independent of distance is found outside this masking region. This constant performance is still lower than expected from masking effects and might reflect attentive processes. Sequential presentation of the targets with delays up to 30-40 ms, while reducing available processing time, does not cause reduction in performance, thus supporting the suggestion that discrimination of the two targets is a serial process. The independence of performance on distance suggests fast noninertial shifts of attention. Author

A87-25511
VERNIER ACUITY PREDICTED FROM CHANGES IN THE LIGHT DISTRIBUTION OF THE RETINAL IMAGE
M. J. MORGAN (University College, London, England) and T. S. AIBA (Hokkaido University, Sapporo, Japan) Spatial Vision (ISSN 0169-1015), vol. 1, no. 2, 1985, p. 151-161. refs

If two thin bars of different luminance are placed side by side, their joint spatial position in a Vernier alignment task is determined simply by their relative luminances. The threshold luminance contrast difference required to produce a just detectable change in spatial position corresponds to a spatial shift of 5-20 arcsec in the centroid of the retinal light distribution, depending upon the contrast relative to the background. This technique may be used to measure acuity with a display that has a spatial resolution considerably worse than the Vernier offset threshold. The centroid technique has also been extended to components that differ both in wavelength and luminance. Color was found to make no essential difference to the task. Taking into account the spread of light in the retinal image, the manifest contrast thresholds are equivalent to threshold intensity increments between adjacent foveal receptors

of less than 1 percent, comparable to the values reported by Hecht and Mintz for dark line detection. Author

A87-25953
PERSISTENCE OF THE ACUTE EFFECTS OF OZONE EXPOSURE
LAWRENCE J. FOLINSBEE and STEVEN M. HORVATH (California, University, Santa Barbara) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Dec. 1986, p. 1136-1143. Research supported by the American Petroleum Institute. refs

To determine the duration of persistent effects of ozone, four groups of subjects were exposed for 1 h to 0.25 ppm ozone and then reexposed at 12, 24, 48, or 72 h, respectively. During the exposure, all subjects exercised continuously at about 65 percent of their respective peak V(O2). Two pulmonary function tests, forced vital capacity and forced expired volume in 1 s (FEV/1.0/), were conducted prior to and 10 min following each exposure. The EKG, heart rate, and ventilation were monitored during the exposure. A questionnaire filled out by the subjects included a list of symptoms typical for ozone exposure. The decrease in FEV(1.0) after the second ozone exposure was significantly larger than that after the first for subjects reexposed at 12 h (12 and 19 percent, respectively) or 24 h (20 and 35 percent, respectively). In subjects reexposed at 48 or 72 h, the FEV(1.0) responses were not significantly different from those in the first exposure. Symptoms of ozone exposure generally paralleled changes in pulmonary function. I.S.

A87-25955
POWER SPECTRAL ANALYSIS OF THE SURFACE ELECTROMYOGRAM DURING SHIVERING
STEPHEN R. MUZA, ANDREW J. YOUNG, MICHAEL N. SAWKA, KENT B. PANDOLF, and JAMES E. BOGART (U.S. Army, Research Institute of Environmental Medicine, Natick, MA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Dec. 1986, p. 1150-1153. refs

Electromyogram (EMG) power spectra analysis was employed to analyze the frequency components of the shivering muscle (masseter) EMG, and to determine the power spectra changes as a function of the cold exposure duration. EMG spectra of the masseter muscle were obtained in seminude males exposed to 5 C for 80 min while quietly sitting, using bipolar surface electrodes. The EMG was amplified, recorded, and subsequently digitized at 2048 Hz; the power spectrum was calculated from eight serial 0.25-s EMG samples by Fourier analysis from a frequency of 4 through 480 Hz. The frequency components of the EMG during shivering were similar to those reported for isometric exercise. The lack of shifts in the power spectrum of the shivering EMG has indicated that 80 min of cold air exposure did not produce significant muscle fatigue or muscle cooling. I.S.

A87-25957
ORTHOSTATIC TOLERANCE AND AEROBIC CAPACITY
ESKO A. LANSIMIES and ERKKI RAUHALA (Kuopio, University, Finland) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Dec. 1986, p. 1158-1164. refs

The responses of heart rate and blood pressure to passive head-up tilting were assessed twice with an interval of two months in 100 healthy, middle-aged men. Then the subjects were randomly allocated into training or nontraining groups. The intervention period of four months was successfully completed by 85 subjects. Mean, indirectly-determined oxygen uptake capacity increased in the training group only. The amplitude of the change in heart rate from supine to tilting and back again was used as the sign of orthostatic tolerance (OT). OT was similar in the training and nontraining groups. When the subjects were grouped according to aerobic fitness, no differences in the OT could be observed. Changes in fitness during the intervention did not induce any changes in orthostatic tolerance. When the whole group was divided according to the OT or change in OT, no significant differences of changes in aerobic fitness were observed. It is concluded that in healthy, ambulatory, middle-aged men orthostatic tolerance and aerobic fitness are not correlated. Author

A87-25958
EFFECTS OF HYPOXIA AND HYPEROXIA ON VENTILATORY KINETICS DURING RECOVERY FROM EXERCISE
ROBERT P. GARNER, SCOTT K. POWERS, and GABIE CHURCH (Louisiana State University, Baton Rouge, LA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Dec. 1986, p. 1165-1169. refs

The purpose of this investigation was to determine the effects of breathing hyperoxic and hypoxic gas mixtures on ventilatory kinetics in the transition from submaximal exercise to rest. Eight male subjects performed three separate single blind exercise tests at 80 percent of their ventilatory threshold. Inspired oxygen concentration was varied in each experimental condition: test one (55 percent O2 -45 percent N2), test two (14 percent O2 -76 percent N2), and test three (21 percent O2 -79 percent N2). Ventilation, heart rate, and gas exchange were measured every 15 s for 6 min of exercise and during 9 min of recovery from exercise. Data analysis revealed no significant (p greater than 0.05) differences in the kinetics of heart rate, oxygen uptake, expired volume of carbon dioxide, or ventilation among treatments during the transition from exercise to rest. Given the belief that hyperoxia attenuates the carotid bodies and hypoxia augments carotid body chemosensitivity, these findings suggest that the carotid bodies are not important regulators of the kinetics of expired ventilation during recovery from exercise. Author

A87-26280
INCREASING THE THERMAL STABILITY OF AN ORGANISM BY MEANS OF HYPOVENTILATIONAL TRAINING [POVYSHENIE TEPLOVOI USTOICHIVOSTI ORGANIZMA S POMOSHCH'IU GIPOVENTILIATSIONNOI TRENIROVKI]
L. A. KOROLEV and V. I. SOBOLEVSKII Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Aug. 1986, p. 40, 41. In Russian. refs

A87-26281
USE OF AN ELECTROTRANQUILIZATION METHOD TO INCREASE VESTIBULAR STABILITY IN HUMANS [ISPOL' ZOVANIE METODA ELEKTROTRANKVILIZATSII DLIA POVY-SHENIIA VESTIGULIARNOI USTOICHIVOSTI CHELOVEKA]
S. G. MELNIK, A. V. SHAKULA, and V. V. IVANOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Aug. 1986, p. 42-45. In Russian. refs

The effect of electrotranquilization treatment (by the method of Kastrubin, 1981) on the stabilization of the vestibular apparatus under conditions inducing motion sickness was studied in healthy subjects, using applications of angular and Coriolis accelerations to induce motion sickness and applying electrotranquilization either before or after accelerations. The level of vestibulo-vegetative stability was estimated from the length of time before the onset of nausea (the 'endurance time') and from the results of a step test; the functional status was evaluated from physiological indices of cardiovascular and respiratory systems. Questionnaires were used for the objective evaluation of well-being. Electrotranquilization was found to have a beneficial effect as a prophilactic treatment, decreasing the intensity of the motion sickness symptoms in all subjects, and greatly increasing the endurance time in some. Treatment after the onset of the sickness was less effective. However, the treatment hastened the recovery. I.S.

A87-27250* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MASKING OF THE CIRCADIAN RHYTHMS OF HEART RATE AND CORE TEMPERATURE BY THE REST-ACTIVITY CYCLE IN MAN
PHILIPPA H. GANDER, LINDA J. CONNELL, and R. CURTIS GRAEBER (NASA, Ames Research Center, Moffett Field, CA) Journal of Biological Rhythms, vol. 1, no. 2, 1986, p. 119-135. refs

Experiments were conducted to estimate the magnitude of the masking effect produced in humans by alternate periods of physical

activity and rest or sleep on the circadian rhythms of heart rate and core temperature. The heart rate, rectal temperature, and nondominant wrist activity were monitored in 12 male subjects during 6 days of normal routine at home and during 6 days of controlled bed-rest regimen. The comparisons of averaged waveforms for the activity, heart rate, and temperature indicated that about 45 percent of the range of the circadian heart rate rhythm during normal routine and about 14 percent of the range of the circadian temperature rhythm were attributable to the effects of activity. The smaller effect of activity on the temperature rhythm may be partially attributable to the fact that core temperature is being more rigorously conserved than heart rate, at least during moderate exercise. I.S.

A87-27344* Massachusetts Inst. of Tech., Cambridge.
M.I.T./CANADIAN VESTIBULAR EXPERIMENTS ON THE SPACELAB-1 MISSION. I - SENSORY ADAPTATION TO WEIGHTLESSNESS AND READAPTATION TO ONE-G: AN OVERVIEW
L. R. YOUNG, C. M. OMAN, B. K. LICHTENBERG (MIT, Cambridge, MA), D. G. D. WATT (McGill University, Montreal, Canada), K. E. MONEY (Defence and Civil Institute of Environmental Medicine, Downsview, Canada) et al. Experimental Brain Research (ISSN 0014-4819), vol. 64, 1986, p. 291-298. Research supported by the Defence and Civil Institute of Environmental Medicine, and Medical Research Council of Canada. refs
(Contract NAS9-15343)

Human sensory/motor adaptation to weightlessness and readaptation to earth's gravity are assessed. Preflight and postflight vestibular and visual responses for the crew on the Spacelab-1 mission are studied; the effect of the abnormal pattern of otolith afferent signals caused by weightlessness on the pitch and roll perception and postural adjustments of the subjects are examined. It is observed that body position and postural reactions change due to weightlessness in order to utilize the varied sensory inputs in a manner suited to microgravity conditions. The aspects of reinterpretation include: (1) tilt acceleration reinterpretation, (2) reduced postural response to z-axis linear acceleration, and (3) increased attention to visual cues. I.F.

A87-27345* Massachusetts Inst. of Tech., Cambridge.
M.I.T./CANADIAN VESTIBULAR EXPERIMENTS ON THE SPACELAB-1 MISSION. II - VISUAL VESTIBULAR TILT INTERACTION IN WEIGHTLESSNESS
L. R. YOUNG, M. SHELHAMER, and S. MODESTINO (MIT, Cambridge, MA) Experimental Brain Research (ISSN 0014-4819), vol. 64, 1986, p. 299-307. refs
(Contract NAS9-15343)

Adaptation to weightlessness includes the substitution of other sensory signals for the no longer appropriate graviceptor information concerning static spatial orientation. Visual-vestibular interaction producing roll circularvection was studied in weightlessness to assess the influence of otolith cues on spatial orientation. Preliminary results from four subjects tested on Spacelab-1 indicate that visual orientation effects were stronger in weightlessness than pre-flight. The rod and frame test of visual field dependence showed a weak post-flight increase in visual influence. Localized tactile cues applied to the feet in space reduced subjective vection strength. Author

A87-27346* McGill Univ., Montreal (Quebec).
M.I.T./CANADIAN VESTIBULAR EXPERIMENTS ON THE SPACELAB-1 MISSION. III - EFFECTS OF PROLONGED WEIGHTLESSNESS ON A HUMAN OTOLITH-SPINAL REFLEX
D. G. D. WATT, K. E. MONEY (McGill University, Montreal, Canada), and L. M. TOMI (Defence and Civil Institute of Environmental Medicine, Downsview, Canada) Experimental Brain Research (ISSN 0014-4819), vol. 64, 1986, p. 308-315. Research supported by the Defence and Civil Institute of Environmental Medicine and NASA; Medical Research Council of Canada. refs
(Contract MRC-MA-5837; MRC-TG-32; MRC-SP-10)

Reflex responses that depend on human otolith organ sensitivity were measured before, during and after a 10 day space flight. Otolith-spinal reflexes were elicited by means of sudden, unexpected falls. In weightlessness, 'falls' were achieved using elastic cords running from a torso harness to the floor. Electromyographic (EMG) activity was recorded from gastrocnemius-soleus. The EMG response occurring in the first 100-120 ms of a fall, considered to be predominantly otolith-spinal in origin, decreased in amplitude immediately upon entering weightlessness, and continued to decline throughout the flight, especially during the first two mission days. The response returned to normal before the first post-flight testing session. The results suggest that information coming from the otolith organs is gradually ignored by the nervous system during prolonged space flight, although the possibility that otolith-spinal reflexes are decreased independent of other otolith output pathways cannot by ruled out. Author

A87-27347* Massachusetts Inst. of Tech., Cambridge.
M.I.T./CANADIAN VESTIBULAR EXPERIMENTS ON THE SPACELAB-1 MISSION. IV - SPACE MOTION SICKNESS: SYMPTOMS, STIMULI, AND PREDICTABILITY
C. M. OMAN, B. K. LICHTENBERG, R. K. MCCOY (MIT, Cambridge, MA), and K. E. MONEY (Defence and Civil Institute of Environmental Medicine, Downsview, Canada) Experimental Brain Research (ISSN 0014-4819), vol. 64, 1986, p. 316-334. Research supported by the Defence and Civil Institute of Environmental Medicine. refs
(Contract NAS9-15343; NAS9-17371)

Three cases of motion sickness that occurred on Spacelab-1 are described. The relation between head movements and symptom intensity is examined. The effects of visual, tactile, and proprioceptive orientation cues on motion sickness are studied. The effectiveness of the drugs used is evaluated and it is observed that the drugs reduce the frequency of vomiting and overall discomfort. Preflight and postflight motion sickness susceptibility data are presented. I.F.

A87-27348* Massachusetts Inst. of Tech., Cambridge.
M.I.T./CANADIAN VESTIBULAR EXPERIMENTS ON THE SPACELAB-1 MISSION. V - POSTURAL RESPONSES FOLLOWING EXPOSURE TO WEIGHTLESSNESS
R. V. KENYON and L. R. YOUNG (MIT, Cambridge, MA) Experimental Brain Research (ISSN 0014-4819), vol. 64, 1986, p. 335-346. refs
(Contract NAS9-15343)

The four science crewmembers of Spacelab-1 were tested for postural control before and after a 10 day mission in weightlessness. Previous reports have shown changes in astronaut postural behavior following a return to earth's 1-g field. This study was designed to identify changes in EMG latency and amplitudes that might explain the instabilities observed post-flight. Erect posture was tested having the subject stand on a pneumatically driven posture platform which pitched rapidly and unexpectedly about the ankles causing dorsi- and plantarflexion. Electromyographic (EMG) activity from the tibialis anterior and the gastrocnemius-soleus muscles was measured during eyes open and eyes closed trials. The early (pre 500 ms) EMG response characteristics (latency, amplitude) in response to a disturbance in the posture of the subject were apparently unchanged by the 10 days of weightlessness. However, the late (post 500 ms) response showed higher amplitudes than was found pre-flight. General postural control was quantitatively measured pre- and post-flight by a 'sharpened Romberg Rails test'. This test showed decrements in standing stability with eyes closed for several days post-flight. Author

A87-27349* Massachusetts Inst. of Tech., Cambridge.
M.I.T./CANADIAN VESTIBULAR EXPERIMENTS ON THE SPACELAB-1 MISSION. VI - VESTIBULAR REACTIONS TO LATERAL ACCELERATION FOLLOWING TEN DAYS OF WEIGHTLESSNESS
A. P. ARROTT and L. R. YOUNG (MIT, Cambridge, MA) Experimental Brain Research (ISSN 0014-4819), vol. 64, 1986, p. 347-357. refs
(Contract NAS9-15343)

The effects of weightlessness on human orientation and balance are investigated. The responses of the Spacelab-1 crew to linear acceleration are measured using a perception of linear motion test, a closed-loop otolith assessment test (CLOAT), a dynamic ocular torsion test, and a lateral eye deviations test. The perception of linear motion tests measures a subject's ability to detect the presence and direction of small changes in linear acceleration; CLOAT assesses a person's ability to use linear acceleration cues to perform a manual control task; and the dynamic ocular torsion test examines the gravitoinertial contribution to dynamic ocular counterrolling. The threshold accelerations, velocity constants, regression coefficients, scalar performance measures, and torsion measurements for the subjects are analyzed and described. It is noted that the data support the tilt-translation reinterpretation hypothesis of Young et al. (1984, 1986). I.F.

N87-17430*# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
SUPERCRITICAL WATER OXIDATION OF PRODUCTS OF HUMAN METABOLISM Final Report
JEFFERSON W. TESTER, GEORGE A. HUFF, RICHARD K. HELLING, T. B. THOMASSON (Modar, Inc., Natick, Mass.), and K. C. SWALLOW 1986 36 p
(Contract NAG2-224; NSG-2403)
(NASA-CR-180144; NAS 1.26:180144) Avail: NTIS HC A03/MF A01 CSCL 06P

Although the efficient destruction of organic material was demonstrated in the supercritical water oxidation process, the reaction kinetics and mechanisms are unknown. The kinetics and mechanisms of carbon monoxide and ammonia oxidation in and reaction with supercritical water were studied experimentally. Experimental oxidation of urine and feces in a microprocessor controlled system was performed. A minaturized supercritical water oxidation process for space applications was design, including preliminary mass and energy balances, power, space and weight requirements. B.G.

N87-17431*# Good Samaritan Hospital and Medical Center, Portland, Oreg. Neurological Sciences Inst.
ROLE OF ORIENTATION REFERENCE SELECTION IN MOTION SICKNESS Semiannual Status Report
ROBERT J. PETERKA and F. OWEN BLACK Feb. 1987 10 p
(Contract NAG9-117)
(NASA-CR-180161; NAS 1.26:180161) Avail: NTIS HC A02/MF A01 CSCL 06S

The objectives of this proposal were developed to further explore and quantify the orientation reference selection abilities of subjects and the relation, if any, between motion sickness and orientation reference selection. The overall objectives of this proposal are to determine (1) if motion sickness susceptibility is related to sensory orientation reference selection abilities of subjects, (2) if abnormal vertical canal-otolith function is the source of these abnormal posture control strategies and if it can be quantified by vestibular and oculomotor reflex measurements, and (3) if quantifiable measures of perception of vestibular and visual motion cues can be related to motion sickness susceptibility and to orientation reference selection ability demonstrated by tests which systematically control the sensory imformation available for orientation. Author

N87-17432# Institut Franco-Allemand de Recherches, St. Louis (France).
BIOLOGICAL EFFECTS OF AERIAL SHOCK WAVES: REVIEW OF WORK TO DATE [EFFETS BIOLOGIQUES DES ONDES DE CHOC AERIENNES: SYNTHESE DES TRAVAUX REALISES A CE JOUR]
P. VASSOUT 20 May 1985 68 p In FRENCH; GERMAN summary
(ISL-NB-402/85; ETN-87-98805) Avail: NTIS HC A04/MF A01

The effects of aerial shock waves on living beings are reviewed. The biological effects of shock waves were studied on several animal species, and extrapolated to human beings. The most strongly affected organs are the eardrum, the respiratory system, and the gastrointestinal system. The effects of shock waves were investigated in the free field and in a reflecting environment, and compared with the effects of strong noise. Protection possibilities were examined. The harmful effects, as well as propagation models for shock waves in a biological medium are reported on. ESA

N87-17770*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ADAPTATION AND READAPTATION MEDICAL CONCERNS OF A MARS TRIP
PHILIP C. JOHNSON *In* NASA. Marshall Space Flight Center Manned Mars Mission. Working Group Papers, V. 2, Sect. 5, App. p 593-600 May 1986
Avail: NTIS HC A24/MF A01 CSCL 06P

The ability of the human body to adapt to microgravity environments and to later readapt to a gravity environment was examined. Issues specifically relating to the effects of long duration space flight on the adaptation/readaptation process are discussed. The need for better health prediction techniques is stressed in order to be able to better anticipate crew health problems and to perform corrective actions. Several specific examples are discussed of latent diseases which could occur during a long duration space mission, even after having subjected the crew to thorough premission checkups. The need for learning how to prevent or ameliorate such problems as space adaptation syndrome, bone and muscle (and possibly tissue) atrophy, immune system atrophy, and heart arrythmias is also discussed. The implications of the age of the crew, the influence of an onboard low level gravity field, and drugs are briefly addressed as factors in the adaptation/readaptation process. Author

N87-17771*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HUMAN ADAPTATION AND READAPTATION FOR MARS MISSION
HARRISON H. SCHMITT *In its* Manned Mars Mission. Working Group Papers, V. 2, Sect. 5, App. p 601-605 May 1986
Avail: NTIS HC A24/MF A01 CSCL 06P

Human adaptation and readaptation in space appears to involve complex physiological and psychological interactions and adjustments. There is no comprehensive clinical characterization of the symptoms of these interactions, much less a comprehensive examination and testing of appropriate measures to counteract the near and long term adverse consequences. The variety of credible potential countermeasures is great; however, a systematic clinical research program for Shuttle and space station must be implemented as an early part of a Mars Mission strategy. Author

N87-17773*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MANNED MARS MISSION HEALTH MAINTENANCE FACILITY
JOSEPH C. DEGIOANNI *In* NASA. Marshall Space Flight Center Manned Mars Mission. Working Group Papers, V. 2, Sect. 5, App. p 613-620 May 1986
Avail: NTIS HC A24/MF A01 CSCL 06E

The Health Maintenance Facility (HMF) requirements which enable/enhance manned Mars missions (MMMs) are addressed. It does not attempt to resolve any issues that may affect the feasibility of any given element in the HMF. Reference is made to current work being conducted in the design of the space station

HMF. The HMF requirements are discussed within the context of two distinctly different scenarios: HMF as part of the Mars surface infrastructure, and HMF as part of the nine months translation from low Earth orbit to Mars orbit. Requirements for an HMF are provided, and a concept of HMF is shown. Author

N87-17776*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MANNED MARS MISSION RADIATION ENVIRONMENT AND RADIOBIOLOGY
D. S. NACHTWEY *In* NASA. Marshall Space Flight Center Manned Mars Mission. Working Group Papers, V. 2, Sect. 5, App. p 634-641 May 1986
Avail: NTIS HC A24/MF A01 CSCL 06R

Potential radiation hazards to crew members on manned Mars missions are discussed. It deals briefly with radiation sources and environments likely to be encountered during various phases of such missions, providing quantitative estimates of these environments. Also provided are quantitative data and discussions on the implications of such radiation on the human body. Various sorts of protective measures are suggested. Recent re-evaluation of allowable dose limits by the National Council of Radiation Protection is discussed, and potential implications from such activity are assessed. Author

N87-17777*# Naval Research Lab., Washington, D. C. Center for Space Science.
NATURAL RADIATION HAZARDS ON THE MANNED MARS MISSION
JOHN R. LETAW, REIN SILBERBERG, and C. H. TSAO *In* NASA. Marshall Space Flight Center Manned Mars Mission. Working Group Papers, V. 2, Sect. 5, App. p 642-655 May 1986
Avail: NTIS HC A24/MF A01 CSCL 06R

The hazards of the natural radiation environment (cosmic rays and solar energetic particles) on a manned mission to Mars are considered. These hazards are addressed in three different settings: the flight to Mars where the astronauts are shielded only by the spacecraft; on the surface of Mars under an atmosphere of about 10 g/sq cm carbon dioxide; and under the surface of Mars where additional shielding would result. Author

N87-17780*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
RADIATION ENVIRONMENT AND SHIELDING FOR EARLY MANNED MARS MISSIONS
STEPHEN B. HALL and MICHAEL E. MCCANN *In its* Manned Mars Mission. Working Group Papers, V. 2, Sect. 5, App. p 686-705 May 1986
Avail: NTIS HC A24/MF A01 CSCL 06R

The problem of shielding a crew during early manned Mars missions is discussed. Requirements for shielding are presented in the context of current astronaut exposure limits, natural ionizing radiation sources, and shielding inherent in a particular Mars vehicle configuration. An estimated range for shielding weight is presented based on the worst solar flare dose, mission duration, and inherent vehicle shielding. Author

N87-17781*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
TOXICOLOGICAL SAFEGUARDS IN THE MANNED MARS MISSIONS
MARTIN E. COLEMAN *In* NASA. Marshall Space Flight Center Manned Mars Mission. Working Group Papers, V. 2, Sect. 5, App. p 706-712 May 1986
Avail: NTIS HC A24/MF A01 CSCL 06E

Safeguards against toxic chemical exposures during manned Mars missions (MMMs) will be important for the maintenance of crew health and the accomplishment of mission objectives. Potential sources include offgassing, thermodegradation or combustion of materials, metabolic products of crew members, and escape of chemical from containment. Spacecraft maximum allowable concentration (SMAC) limits will have to be established for potential contaminants during the MMMs. The following factors will be used in establishing these limits: duration of mission, simultaneous exposure to other contaminants, deconditioning of crew members after long periods of reduced gravity, and simultaneous exposure to ionizing radiation. Atmospheric contaminant levels in all compartments of the transit spacecraft and Manned Mars Station (MMS) will be monitored at frequent intervals with a real time analyzer. This analyzer will be highly automated, requiring minimal crew time and expertise. The atmospheric analyzer will find other usages during the MMMs such as analyzing Martian atmospheres and soils, exhaled breath and body fluids of crew members, and reaction products in chemical processing facilities. Author

N87-18301*# National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 294)
Feb. 1987 59 p
(NASA-SP-7011(294); NAS 1.21:7011(294)) Avail: NTIS HC A04 CSCL 06E

This bibliography lists 146 reports, articles and other documents introduced into the NASA scientific and technical information system in January, 1987. Author

N87-18302# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Industrial Engineering and Operations Research.
VEHICULAR SIMULATOR-INDUCED SICKNESS. VOLUME 3: SURVEY OF ETIOLOGICAL FACTORS AND RESEARCH FACILITY REQUIREMENTS Final Report
JOHN G. CASALI and WALTER W. WIERVILLE Aug. 1986 162 p
(Contract N00014-84-K-0226)
(AD-A173226; IEOR-TR-8503; NTSC-TR-86-012) Avail: NTIS HC A08/MF A01 CSCL 05I

A site survey of eight Naval and Marine flight training simulators was conducted to ascertain potential simulator design and procedural aspects with potential for influencing simulator-induced sickness. The results of this survey, described in this report, are catalogued in a set of seven tables including information on various simulator subsystems and simulator-induced sickness incidence. These tables include overviews of simulator visual systems, motion-cuing systems, motion-base parameters, cockpit interior systems, operator/training procedures, reported simulator anomalies, and simulator-induced sickness/aftereffects. Based on this survey, a listing of candidate simulator and operating procedure variables for study is provided. These variables were rated according to their priority for research and their feasibility for laboratory investigation as potential etiological factors in the provaction of simulator-induced sickness. Also provided is a listing of dependent measures amenable for use in research on simulator sickness. A variety of physiological, ataxia, psychomotor, perceptual, task performance, and self-report metrics are suggested. The last section of the report is devoted to the specification of a generic simulator facility aimed at the study of simulator-induced sickness. GRA

N87-18303# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
MEDICALLY DISQUALIFIED AIRLINE PILOTS Final Report
SHIRLEY J. DARK Jun. 1986 18 p
(AD-A173244; FAA/AM-86/17) Avail: NTIS HC A02/MF A01 CSCL 06E

This study presents comprehensive data reflecting pertinent denial rates regarding the medical and general attributes of those airline pilots denied medical certification in calendar years 1983 and 1984. The overall annual denial rate of this group is 4.7 per 1,000 active airline pilots. Age-specific denial rates for airline pilots increase to the highest rate at age interval 55 to 59. The most significant causes for denial are cardiovascular, neuropsychiatric, and the miscellaneous category. The importance of these causes for denial, particularly above age 45, is again recognized. Denials for cardiovascular reasons account for 33% of all denials in this

airline pilot group. Reasons/causes for denial and age-specific denial rates are changing. Denial rates of older pilots have decreased while rates for younger pilots have increased when compared with previous studies' rates. This could be attributed to changes in the interpretation of FAA regulations, certification policies, and pilots' concepts and concerns regarding the economic status of their employer. On the basis of these and previous findings, pilots should be educated to report history or symptoms of any disease during their periodic medical certification examinations. GRA

N87-18304# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.

EFFECTS OF SLEEP LOSS ON VESTIBULAR RESPONSE DURING SIMPLE AND COMPLEX VESTIBULAR STIMULATION Final Report

WILLIAM E. COLLINS Jul. 1986 20 p

(AD-A173292; FAA/AM-86/9) Avail: NTIS HC A02/MF A01 CSCL 06S

Few data are available concerning the effects of sleep loss on vestibular responses although those responses are significant products of motion in aviation environments. This study assessed periodically throughout approx. 55 hrs. of sleep loss the ocular nystagmus and motion experiences of men exposed to both simple (angular acceleration and complex- Coriolis) vestibular stimulation. The effects on those responses of an alerting drug administered after 54 hr of sleep loss were also examined. Control and sleep-deprived groups each comprised 10 young men. Angular accelerations and Coriolis stimulation (30-deg head movements during CW rotation) were accomplished in an enclosed Stille-Werner rotating device. Nystagmus and motion experience (turning, diving, and climbing) were recorded for each session. Tests were given at 0900 and 1300 on each of 3 successive days. Subjects ingested 10-mg of d-amphetamine at 1200 on day 3. During simple stimulation, the sleep-deprived group showed regular declines across sessions in slow phases and duration measures of nystagmus but fast phase ocular frequency and measures of experienced turning resisted declines until the final predrug session; response latencies increased with sleep loss. Declines during rotation for ocular (climbing sensation) were obtained for the sleep deprived, but both nystagmus and sensations were unaffected d-amphetamine had no consistent effect on either the ocular or subjective responses of control subjects. GRA

N87-18305# Army Research Inst. of Environmental Medicine, Natick, Mass.

COOLING DIFFERENT BODY SURFACES DURING UPPER-AND-LOWER BODY EXERCISE

ANDREW J. YOUNG, MICHAEL N. SAWKA, YORAM EPSTEIN, BARRY DECRISTOFANO, and KENT B. PANDOLF Sep. 1986 25 p

(AD-A173320; USARIEM-M-54-86) Avail: NTIS HC A02/MF A01 CSCL 06S

The effect of varying the body surface area being cooled by a liquid microclimate system was evaluated during exercise/heat stress conditions. Six male subjects performed a total of six exercise tests in a hot environment while dressed in a clothing ensemble having low moisture-permeability and high insulation. Each subject completed two upper body exercise tests: (1) with only the torso surface cooled; and (2) with the surfaces of both the torso and upper arms cooled. Each subject also completed four lower body exercise tests: (1) with only the torso surface cooled at -20 C; (2) with only the torso surface cooled at -26 C; (3) with torso, thigh, and upper arm surface cooled at -20 C; and (4) with torso, thigh, and upper arm surface cooled at -26 C. During upper body exercise, cooling the upper arms in addition to the torso had no effect on any measured parameter. During lower body exercise, reductions in the sweat rate, heart rate and change in rectal temperature were observed with torso, thigh and upper arm cooling compared to cooling only the torso. Altering coolant temperatures had no effect on changes in rectal temperature but higher heart rates were observed with 26 C coolant temperature compared to 20 C. Author

N87-18306# Colorado Univ., Denver. Health Sciences Center.

OPERATION EVEREST 2: PRESERVATION OF CARDIAC FUNCTION AT EXTREME ALTITUDE

JOHN T. REEVES, BERTRON M. GROVES, JOHN R. SUTTON, PETER D. WAGNER, and ALLEN CYMERMAN Oct. 1986 34 p

(Contract DAMD17-85-C-5206)

(AD-A173322) Avail: NTIS HC A03/MF A01 CSCL 06E

Hypoxia at high altitude could depress cardiac function and decrease exercise capacity. If so, impaired cardiac function should occur with the extreme, chronic hypoxemia of the 40 day simulated climb of Mt. Everest (8840m, Pa 240 mmHg, PIO2 43 mmHg). In the 5 subjects having resting and exercise measurements at the barometric pressures of 760 (sea level), 347 (6100m), 282 (7620m), and 240 mmHg, heart rate for a given oxygen uptake rose with the progressive hypoxia. Slight (6 beats/min) slowing of the heart rate occurred only during exercise, with arterial blood oxygen saturations below 50%. Oxygen breathing reversed hypoxemia but never increased heart rate, suggesting that depression of rate, if present, was slight. For a given oxygen uptake, cardiac output was maintained. The decrease in stroke volume appeared to reflect decreased ventricular filling i.e., decreased right atrial and wedge pressures. Oxygen breathing did not increase stroke volume for a given filling pressure. We concluded that extreme, chronic hypoxemia caused little or no impairment of cardiac rate and pump functions. GRA

N87-18307# Army Research Inst. of Environmental Medicine, Natick, Mass.

OPERATION EVEREST 2: ALVEOLAR AND ARTERIAL BLOOD GASES AT EXTREME ALTITUDE

MARK K. MALCONIAN, PAUL B. ROCK, JOHN T. REEVES, ALLEN CYMERMAN, and JOHN R. SUTTON Jul. 1986 36 p

(AD-A173401; USARIEM-M44/86) Avail: NTIS HC A03/MF A01 CSCL 06S

The relationship between alveolar P02 and PC02 at altitudes up to the summit of Mt. Everest (barometric pressure (Pb) =240 torr) has been investigated in a small number of individuals during mountaineering expeditions and one hypobaric chamber study. No previous study has measured these values on the same subjects throughout an entire ascent and confirmed their results with arterial blood gases. Alvelolar gases were measured daily on eight healthy male subjects in a decompression chamber from sea level to a simulated summit of Mt. Everest (Pb=240torr). Arterial blood gases were measured on eight occasions. Below 575 torr, a linear relation was observed between P02 and PC02 in both arterial and alveolar samples. GRA

N87-18308# Naval Health Research Center, San Diego, Calif.

SEDATING AND NONSEDATING SLEEPING AIDS IN AIR OPERATIONS Interim Report, Oct. 1985 - Jul. 1986

CHERYL L. SPINWEBER 14 Jul. 1986 21 p

(AD-A173503; NAVHLTHRSCHC-86-18) Avail: NTIS HC A02/MF A01 CSCL 06O

Both sedating and nonsedating sleeping aids may be appropriate for use in specific operational environments to promote sleep and permit efficient utilization of rest periods. Sedating agents, such as the benzodiazepine triazolam, produce an impairment window which is a period of time post administration when performance and responsivity during sleep are impaired. Nonsedating agents, such as the amino acid 1-tryptophan, enhance sleep but do not alter performance or responsivity at any time post administration. In a field trial of use of 1-tryptophan in U.S. Marines airlifted from California to Okinawa, 1-tryptophan increased total sleep time the first night after arrival. This sleep enhancement was associated with significantly faster reaction times the next day, sparing of short-term memory from jet-lag effects, and more rapid recovery of reaction time over the first three days after arrival. Which type of agent to use in support of an air operation will be determined by the nature of the environments in which rest periods will occur and the duration of scheduled sleep times. GRA

N87-18309# School of Aerospace Medicine, Brooks AFB, Tex.
SUBCONTACT LENS BUBBLE FORMATION UNDER LOW ATMOSPHERIC PRESSURE CONDITIONS Progress Report, Jun. 1984 - Dec. 1985
WILLIAM J. FLYNN, ROBERT E. MILLER, II, THOMAS J. TREDICI, MICHAEL G. BLOCK, and EDWARD E. KIRBY Aug. 1986 8 p
(AD-A173533; USAFSAM-TR-86-21) Avail: NTIS HC A02/MF A01 CSCL 06Q

Concern regarding contact lens wear in aviation has been the fear of subcontact lens bubble formation. Previous reports have documented the occurrence of bubbles with hard PMMA lenses. Reported here are the results of contact lens bubble studies with soft hydrophilic and rigid gas-permeable lenses. Testing was accomplished in simulated aircraft flights in hypobaric chambers and onboard military transport aircraft. Hypobaric chamberflights were of 3 types: high-altitude flights up to 25,000 ft; explosive rapid decompressions from 8,000 ft to 25,000 ft; and 4-h flights at 10,000 ft. Transport aircraft typically had cabin pressures equivalent to 5,000 ft to 8,000 ft and ranged in duration from 3 to 10 h. For rigid gas-permeable lenses, central bubbles were detected in 2 of 10 eyes and occurred at altitudes greater than 20,000 ft. For soft contact lenses, bubble formation detected in 22 of 92 eyes tested, and occurred at altitudes as low as 6,000 ft. Soft lens bubbles were located only at the limbus and were without sequela to vision or corneal epithelial integrity. Bubbles under the rigid lenses were primarily central, with potential adverse effects on vision and the corneal epithelium. GRA

N87-18310# School of Aerospace Medicine, Brooks AFB, Tex.
EFFECTS OF AVIATION ALTITUDES ON SOFT CONTACT LENS WEAR Progress Report, Jun. 1983 - Jun. 1986
WILLIAM J. FLYNN, ROBERT E. MILLER, II, THOMAS J. TREDICI, and MICHAEL G. BLOCK Aug. 1986 17 p
(AD-A173534; USAFSAM-TR-86-20) Avail: NTIS HC A02/MF A01 CSCL 06Q

Aviation in the U.S. Air Force can be divided into two categories on the basis of aircraft cabin environments: (1) Fighter-attack-reconnaissance (FAR) aircraft with cabin pressures equivalent to high altitudes, and (2) tanker-transport-bomber (TTB) aircraft with cabin pressures equivalent to lower altitudes, but for longer durations. The purpose of this study was to determine the effects of soft contact lens wear in these two types of aircraft environments. Ten subjects were tested in hypobaric chamber flights at 10,000 ft for 4 hr to simulate TTB flying. Four of these 12 subjects were also tested in dry air to further simulate cabin conditions. Vision and physiologic response were monitored by measurements of visual acuity, contrast sensitivity, and slit-lamp examinations. The results indicate that the physiologic response of the cornea to soft contact lens wear at altitude is subject to higher levels of manifested stresses, but these occurred without measurable degradation in vision and did not preclude the normal wearing of the soft contact lenses under the conditions of this study. GRA

N87-18311# Army Research Inst. of Environmental Medicine, Natick, Mass.
AUTOLOGOUS RED BLOOD CELL REINFUSION: EFFECTS ON STRESS AND FLUID REGULATORY HORMONES DURING EXERCISE-HEAT STRESS
RALPH P. FRANCESCONI, M. N. SAWKA, R. C. DENNIS, R. R. GONZALEZ, and A. J. YOUNG Jul. 1986 25 p
(AD-A172545; USARIEM-M-48-86) Avail: NTIS HC A02/MF A01 CSCL 06S

This study assessed the effects of induced erythrocythemia on stress and fluid regulatory hormones during exercise in the heat. Six unacclimated male subjects received approximately 600 ml of a sterile saline solution containing 50% v/v of autologous erythrocytes. Three heat stress tests (HST's) were attempted: one approximately 2 weeks prior to the reinfusion procedure, a second 48 h after the reinfusion procedure, and a third 1 wk later corresponding to 9 d subsequent to reinfusion. Each HST comprised three consecutive exercise and rest intervals of 45/15 min, respectively (VO2 approx. 2.0 L/min, 1.56 m/s, 6% incline, 35 C, 45% rh). Blood was withdrawn before the HST and 30 min into each exercise (EX) bout. In all 3 HST's plasma cortisol (PC) levels were significantly (p is less than .01) reduced during the first exercise bout when compared to pre-exercise levels, and then progressively increased during the second and third exercise intervals during HST 1. During HST 2 (48h post-infusion), however, PC levels were same blood samples from HST-1 (pre-infusion). Plasma renin activity (PRA) and aldosterone (ALD) were significantly (p is less than .01) increased by the exercise/heat stress, but were unaffected by erythrocythemia either 48 h or 9 d subsequent to reinfusion. PRA and ALD were correlated ($r=0.84$, p is less than .001) under all conditions. GRA

N87-18312# David Sarnoff Research Center, Princeton, N.J.
PORTABLE DIAGNOSTIC RADIOMETER Final Report, 1 Jul. 1984 - 15 Sep. 1985
R. W. PAGLIONE Jun. 1986 38 p
(Contract N00014-83-C-0524)
(AD-A173761; PRRL-86-CR-10) Avail: NTIS HC A03/MF A01 CSCL 06L

A need exists for a portable diagnostic instrument that can non-invasively monitor and display internal body temperatures. This instrument would be extremely important on U.S. Navy ships whose complement does not include the services of competent medical professionals. It would be important to determine whether a particular medical emergency would require that the patient be evacuated to a suitable medical facility for treatment. The instrument would determine, by radiometric means, if there is an elevated temperature inside the body. For example, this may be helpful in the diagnosis of appendicitis or nephritis. The instrument described is a dual-frequency microwave radiometer, which measures the amount of noise power being radiated from a localized tissue volume inside the patient. The amplitude of this noise power over a frequency spectrum determined by the microwave components is proportional to the average temperature of the volume in question. Making this measurement at two separate frequencies can give an indication of the temperature profile over a depth as great as 6 cm. GRA

N87-18313# Institut Franco-Allemand de Recherches, St. Louis (France).
THE BIOMECHANICS OF HEARING [BIOMECANIQUE DE L'AUDITION]
A. DANCER 15 Jan. 1986 111 p In FRENCH; GERMAN summary
(ISL-R-102/86; ETN-87-98793) Avail: NTIS HC A06/MF A01

The conditions for the transmission of an acoustic signal from the free field to the inner ear as well as the dissipation in this organ were investigated. The transfer functions of the outer and middle ear are described. Hydrodynamic phenomena in the cochlea are explained on the basis of physical and mathematical models. Passive and active phenomena in the cochlea were studied; it is shown that they determine a large number of the electrophysiological reactions of the inner ear. The biomechanics of the peripheral hearing organ thus represents an essential element in the understanding of its physiology. ESA

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A87-23438* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
APPARENT MOTION OCCURS ONLY BETWEEN SIMILAR SPATIAL FREQUENCIES
ANDREW B. WATSON (NASA, Ames Research Center, Moffett Field, CA) Vision Research (ISSN 0042-6989), vol. 26, no. 10, 1986, p. 1727-1730. refs

Whether apparent motion occurs only between targets of similar spatial frequency was examined. A 'crossed phi' method was used, in which two potentially different targets exchange position. If the targets differ in a feature that controls apparent motion then they will appear to move so as to exchange positions; if they differ in an irrelevant feature, no apparent exchange will occur. It was found that apparent motion occurs only between similar spatial frequencies. This result is interpreted in the light of recent models of human visual motion sensing, in which motion estimates are computed separately within a number of spatial frequency bands. Author

A87-23440* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ANISOTROPIC RESPONSES TO MOTION TOWARD AND AWAY FROM THE EYE
JOHN A. PERRONE (NASA, Ames Research Center, Moffett Field, CA) Perception and Psychophysics (ISSN 0031-5117), vol. 39, no. 1, 1986, p. 1-8. refs

When a rigid object moves toward the eye, it is usually perceived as being rigid. However, in the case of motion away from the eye, the motion and structure of the object are perceived nonveridically, with the percept tending to reflect the nonrigid transformations that are present in the retinal image. This difference in response to motion to and from the observer was quantified in an experiment using wire-frame computer-generated boxes which moved toward and away from the eye. Two theoretical systems are developed by which uniform three-dimensional velocity can be recovered from an expansion pattern of nonuniform velocity vectors. It is proposed that the human visual system uses two similar systems for processing motion in depth. The mechanism used for motion away from the eye produces perceptual errors because it is not suited to objects with a depth component. Author

A87-25400
USING LOW-LEVEL FILTERS TO ENCODE SPATIAL DISPLACEMENTS OF VISUAL STIMULI
ALLAN PANTLE and KENYON HICKS (Miami University, Oxford, OH) Spatial Vision (ISSN 0169-1015), vol. 1, no. 1, 1985, p. 69-82. refs
(Contract F33615-81-K-0514; F33615-83-C-0507)

Directional responses to visual stimuli were analyzed with the aid of a minimal computational model. The model is based upon arrays of motion sensors whose receptive fields are modified versions of those (difference-of-Gaussians) used to describe mechanisms in popular spatial vision models. In the model antagonistic influences on each motion sensor were assumed to: (1) arise from spatially nonaligned areas of the retina; and (2) to follow different time courses. Implications of the model were explored with simulations, and parallel psychophysical data were collected. Visual behaviors chosen for relatively detailed analysis were judgments of the temporal order of onset of two spatially displaced stimuli and motion aftereffects generated with discontinuously moving, sine-wave gratings. Author

A87-25512
SELECTIVE INTERNAL OPERATIONS IN THE RECOGNITION OF LOCALLY AND GLOBALLY POINT-INVERTED PATTERNS
WALTER F. BISCHOF, DAVID H. FOSTER, and JEREMY I. KAHN (Keele, University, England) Spatial Vision (ISSN 0169-1015), vol. 1, no. 2, 1985, p. 179-196. refs
(Contract SNSF-81,166,0,84)

Performance in discriminating rotated 'same' patterns from 'different' patterns may decrease with rotation angle up to about 90 deg and then increase with angle up to 180 deg. This anomalously improved performance under 180 deg pattern rotation or point-inversion can be explained by assuming that patterns are internally represented in terms of local features and their spatial-order relations ('left of', 'above', etc.), and that, in pattern comparison, an efficient internal sense-reversal operation occurs (transforming 'left of' to 'right of', etc.). Previous experiments suggested that local features and spatial relations could not be efficiently separated in some pattern-comparison tasks. This hypothesis was tested by measuring 'same-different' discrimination performance under four transformations: (1) point-inversion of the whole pattern, (2) point-inversion of local features alone, (3) point-inversion of local-feature positions alone, and (4) identity transformation. The results suggested that internal sense-reversal operations could be applied selectively and efficiently, provided that local features were well separated. Under this condition, performances for 1 and 2 were about the same whereas performance for 3 was significantly worse, the latter performance resulting possibly from an attempt to apply internal global and local sense-reversal operations serially. Author

A87-25637
HYSTERESIS IN THE PERCEPTION OF MOTION DIRECTION AS EVIDENCE FOR NEURAL COOPERATIVITY
DOUGLAS WILLIAMS, GREGORY PHILLIPS, and ROBERT SEKULER (Illinois, University, Evanston) Nature (ISSN 0028-0836), vol. 324, Nov. 20, 1986, p. 253-255. USAF-supported research. refs

Results of experimental perception tests using dynamic random dot cinematograms are reported which demonstrate hysteresis in the perception of motion direction. This outcome strongly supports a cooperative interpretation of motion perception. The results agree quantitatively with a mathematical model incorporating nonlinear excitatory and inhibitory interactions among direction-selective elements. C.D.

A87-25850
DEVELOPMENT OF BETTER COCKPIT TRAINING PROGRAMMES UNDER WAY
N. F. NIKULIN (Kirovogradskoe Vysshee Letnoe Uchilishche Grazhdanskoi Aviatsii, Kirovograd, Ukrainian SSR) ICAO Bulletin, vol. 41, Oct. 1986, p. 32-35.

Training requirements for achieving improved crew-response reliability under different operating conditions are discussed. The basic steps involved in training pilots on new aircraft are presented. It is necessary for the flight crew training program to consider the individual characteristics of pilot trainees, the time constraints on the pilot activities, and the amount of pilot workload. An efficient flight training program should match the flow of information from training to the optimal pilot workload under anticipated and unusual conditions. Training must be based on the solution to a specific problem and involve the use of different types of simulators and aircraft. I.F.

A87-25959* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INTERNATIONAL AIRCREW SLEEP AND WAKEFULNESS AFTER MULTIPLE TIME ZONE FLIGHTS - A COOPERATIVE STUDY
R. CURTIS GRAEBER, JOHN K. LAUBER, LINDA J. CONNELL, and PHILIPPA H. GANDER (NASA, Ames Research Center, Moffett Field, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Dec. 1986, p. B3-B9. refs

An international research team has carried out an electroencephalographic study of sleep and wakefulness in flight crews operating long-haul routes across seven or eight time zones. Following baseline recordings, volunteer crews (n = 56) from four airlines spent their first outbound layover at a sleep laboratory. This paper provides an overview of the project's history, its research design, and the standardization of procedures. The overall results are remarkably consistent among the four participating laboratories and strongly support the feasibility of cooperative international sleep research in the operational arena. Author

A87-25960* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INTERNATIONAL COOPERATIVE STUDY OF AIRCREW LAYOVER SLEEP OPERATIONAL SUMMARY
R. CURTIS GRAEBER (NASA, Ames Research Center, Moffet Field, CA), WILLIAM C. DEMENT (Stanford University, CA), ANTHONY N. NICHOLSON (RAF, Institute of Aviation Medicine, Farnborough, England), MITSUO SASAKI (Japan Air Lines, Co., Ltd., Flight Crew Medical Dept., Tokyo), and HANS M. WEGMANN (DFVLR, Institut fuer Flugmedizin, Cologne, West Germany) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Dec. 1986, p. B10-B13.

The findings of this cooperative study of layover sleep have direct implications for flight operations. In the consensus view of the principal investigators, these can be divided into their relevance for eastward or westward flight. Eastward flight produced more sleep disruption than westward. Different sleep and scheduling strategies are recommended for each flight direction, and the importance of individual crewmember factors is discussed in relation to age and circadian type. Despite the limitations of this study with regard to trip simplicity and the baseline data, the results for each airline are highly consistent and should be applicable to a wide range of long-haul crewmembers and carriers. Author

A87-25961* Stanford Univ., Calif.
SLEEP AND WAKEFULNESS IN AIRCREW BEFORE AND AFTER TRANSOCEANIC FLIGHTS
WILLIAM C. DEMENT, WESLEY F. SEIDEL, SUZANNE A. COHEN, MARY A. CARSKADON (Stanford University, CA), and NANCY G. BLIWISE (California, University, San Francisco) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Dec. 1986, p. B14-B28. refs
(Contract NCC2-302; NIH-MH-05804)

The effects of rapid transmeridian flight on sleep and wakefulness were studied in aircrew members before and after flying one of two routes: San Francisco (SFO) to London (LHR) or SFO to Tokyo. After an adaptation night, sleep and daytime sleepiness were measured objectively in SFO and during the first layover (L/O) of the target trip, using the 'core measures' described by Graeber et al. (1986) and respiration parameters, and the Multiple Sleep Latency Test (MSLT) described by Carscadon (1982); postsleep questionnaires provided subjective assessments. It was found that baseline sleep is not an ideal basis for subsequent comparison; nevertheless, there was an indication that L/O sleep periods tended to provide either less total sleep or less efficient sleep. During baseline, there was significant midday sleepiness tendency as measured by the MSLT; this tendency occurred at almost the same time on the second L/O day in LHR. Recommendations are offered for the adjustment of flight times and for scheduling times of permitted napping as accommodations for the periods of sleepiness tendency. I.S.

A87-25962* Japan Air Lines Co. Ltd., Tokyo.
PATTERNS OF SLEEP-WAKEFULNESS BEFORE AND AFTER TRANSMERIDIAN FLIGHT IN COMMERCIAL AIRLINE PILOTS
MITSUO SASAKI, YUKO KUROSAKI (Japan Air Lines, Co., Ltd., Flight Crew Medical Service Dept., Tokyo), ATSUYOSHI MORI (Jikei University, Tokyo, Japan), and SHIRO ENDO (Tokyo, Psychiatric Research Institute, Japan) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Dec. 1986, p. B29-B42. refs
(Contract NCC2-302)

A87-25963* Royal Air Force, Farnborough (England).
NOCTURNAL SLEEP AND DAYTIME ALERTNESS OF AIRCREW AFTER TRANSMERIDIAN FLIGHTS
ANTHONY N. NICHOLSON, PETA A. PASCOE, MICHAEL B. SPENCER, BARBARA M. STONE (RAF, Institute of Aviation Medicine, Farnborough, England), and ROGER L. GREEN (British Airways, Medical Service, Hounslow, England) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Dec. 1986, p. B43-B52. Research supported by the Civil Aviation Authority of England. refs
(Contract NCC2-302)

The nocturnal sleep and daytime alertness of aircrew were studied by electroencephalography and the multiple sleep latency test. After a transmeridian flight from London To San Francisco, sleep onset was faster and, although there was increased wakefulness during the second half of the night, sleep duration and efficiency over the whole night were not changed. The progressive decrease in sleep latencies observed normally in the multiple sleep latency test during the morning continued throughout the day after arrival. Of the 13 subjects, 12 took a nap of around 1-h duration in the afternoon preceding the return flight. These naps would have been encouraged by the drowsiness at this time and facilitated by the departure of the aircraft being scheduled during the early evening. An early evening departure had the further advantage that the circadian increase in vigilance expected during the early part of the day would occur during the latter part of the return flight. Author

A87-25964* Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
SLEEP, SLEEPINESS, AND CIRCADIAN RHYTHMICITY IN AIRCREWS OPERATING ON TRANSATLANTIC ROUTES
HANS M. WEGMANN, ALEXANDER GUNDEL, ALEXANDER SAMEL, EDWIN SCHWARTZ (DFVLR, Institut fuer Flugmedizin, Cologne, West Germany), MARTIN NAUMANN (Deutsche Lufthansa AG, Frankfurt am Main, West Germany) et al. Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Dec. 1986, p. B53-B64. Research supported by the Bundesministerium fuer Verkehr. refs
(Contract NCC2-302)

A two-phase study was performed on B-747 crew members operating on regular passenger flights with 9-h time difference. In phase I, sleep-log surveys were obtained. The results for the layover period indicate congruent sleep patterns with shifts in sleep onset less than 9 h: sleep duration was prolonged. Phase II consisted of polygraphic sleep recordings and multiple sleep latency tests (MSLTs) applied to four cockpit crews in a baseline period, during the layover, and after return to home base. During the layover, mean bed times were shifted by about 4.5 h, and sleep was disturbed by early and prolonged awakenings which led to a reduction of sleep efficiency. The ECG and rectal temperature recordings gave evidence for a desynchronization of the circadian system and an internal dissociation of different body functions. I.S.

A87-27525* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INTUITIVE REASONING ABOUT ABSTRACT AND FAMILIAR PHYSICS PROBLEMS
MARY KISTER KAISER (NASA, Ames Research Center, Moffett Field, CA), JOHN JONIDES, and JOANNE ALEXANDER (Michigan, University, Ann Arbor) Memory and Cognition (ISSN 0090-502X), vol. 14, no. 4, 1986, p. 308-312. USAF-supported research. refs

Previous research has demonstrated that many people have misconceptions about basic properties of motion. Two experiments examined whether people are more likely to produce dynamically correct predictions about basic motion problems involving situations with which they are familiar, and whether solving such problems enhances performance on a subsequent abstract problem. In experiment 1, college students were asked to predict the trajectories of objects exiting a curved tube. Subjects were more accurate on the familiar version of the problem, and there was no evidence of transfer to the abstract problem. In experiment 2, two familiar problems were provided in an attempt to enhance subjects' tendency to extract the general structure of the problems. Once again, they gave more correct responses to the familiar problems but failed to generalize to the abstract problem. Formal physics training was associated with correct predictions for the abstract problem but was unrelated to performance on the familiar problems. Author

N87-17774*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MANNED MARS MISSION PSYCHOLOGICAL ISSUES
PATRICIA A. SANTY *In* NASA. Marshall Space Flight Center Manned Mars Mission. Working Group Papers, V. 2, Sect. 5, App. p 621-629 May 1986
Avail: NTIS HC A24/MF A01 CSCL 05I

The research on isolated environments over the last thirty years suggests that psychological factors associated with such environments will lead to negative changes in individual and group performance. A mission to Mars will be the greatest undertaking ever devised by the human species. The members of such a mission will be in an environment whose potential dangers are not even completely known at this time. The psychological factors generated by such an environment, and which might adversely affect accomplishment of mission goals, can be minimized or planned for in advance. It is hoped that these issues will not be ignored in planning for this great adventure. Author

N87-17778*# National Aeronautics and Space Administration, Washington, D.C.
SOCIO/PSYCHOLOGICAL ISSUES FOR A MARS MISSION
B. J. BLUTH *In* NASA. Marshall Space Flight Center Manned Mars Mission. Working Group Papers, V. 2, Sect. 5, App. p 656-673 May 1986
Avail: NTIS HC A24/MF A01 CSCL 05I

Some of the socio/psychological problems expected to accompany such a long duration mission as the trip to Mars are addressed. The emphasis is on those issues which are expected to have a bearing on crew performance. Results from research into aircraft accidents, particularly those related to pilot performance, are discussed briefly, as a limited analog to space flight. Significant comparisons are also made to some aspects of long duration Antarctic stays, submarine missions, and oceanographic vessel voyages. Appropriate lessons learned from U.S. and Russian space flight experiences are provided. Design of space missions and systems to enhance crew performance is discussed at length, considering factors external and internal to the crew. The importance of incorporating such design factors early in the design process is stressed. Author

N87-17803*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AUTOMATION, ROBOTICS, AND INFLIGHT TRAINING FOR MANNED MARS MISSIONS
ALAN C. HOLT *In* NASA. Marshall Space Flight Center Manned Mars Mission. Working Group Papers, V. 2, Sect. 5, App. p 977-986 May 1986
Avail: NTIS HC A24/MF A01 CSCL 05I

The automation, robotics, and inflight training requirements of manned Mars missions will be supported by similar capabilities developed for the space station program. Evolutionary space station onboard training facilities will allow the crewmembers to minimize the amount of training received on the ground by providing extensive onboard access to system and experiment malfunction procedures, maintenance procedures, repair procedures, and associated video sequences. Considerable on-the-job training will also be conducted for space station management, mobile remote manipulator operations, proximity operations with the Orbital Maneuvering Vehicle (and later the Orbit Transfer Vehicle), and telerobotics and mobile robots. A similar approach could be used for manned Mars mission training with significant additions such as high fidelity image generation and simulation systems such as holographic projection systems for Mars landing, ascent, and rendezvous training. In addition, a substantial increase in the use of automation and robotics for hazardous and tedious tasks would be expected for Mars mission. Mobile robots may be used to assist in the assembly, test and checkout of the Mars spacecraft, in the handling of nuclear components and hazardous chemical propellent transfer operations, in major spacecraft repair tasks which might be needed (repair of a micrometeroid penetration, for example), in the construction of a Mars base, and for routine maintenance of the base when unmanned. Author

N87-18314# Delaware Univ., Newark. Dept. of Psychology.
THE ROLE OF ATTENTION IN AUTOMATIC SKILLS Final Report, 1 Mar. 1983 - 31 May 1986
JAMES E. HOFFMAN 1 Aug. 1986 8 p
(Contract DAAG29-83-K-0049)
(AD-A173190; ARO-20502.7-LS) Avail: NTIS HC A02/MF A01 CSCL 05J

The nature of performance in highly practiced detection and recognition skills was investigated. It was found that several tasks that were reputed to be automatic were susceptible to dual-task interference. Two separate limited capacity systems were identified as important in these tasks. The first is a response system and the second is a modality-specific spatial attention system. The latter system is thought to be necessary for conjunction of separable features such as color and form. Recent work on this contract shows, however, that at least some preattentive systems have access to conjunction information automatically. Future work should be directed at determining which feature conjunctions are present preattentively and which require attention. GRA

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A87-24358
ERGONOMIC SUPPORT OF COSMONAUT ACTIVITY [ERGONOMICHESKOE OBESPECHENIE DEIATEL'NOSTI KOSMONAVTOV]
PAVEL ROMANOVICH POPOVICH, ANATOLII ILICH GUBINSKII, and GENNADII MIKHAILOVIC KOLESNIKOV Moscow, Izdatel'stvo Mashinostroenie, 1985, 256 p. In Russian. refs

A systems analysis of cosmonaut-machine systems is given with emphasis on the evolution of types of cosmonaut activity.

The method of functional grids is developed for ergonomic-support problems for cosmonaut activity. The evaluation of ergatic systems using functional grids is considered, and aspects of ergonomic design are discussed. Finally, applied methods for solving problems of ergonomic support are examined. B.J.

A87-25216
BIOLOGICAL EFFECTS OF LOW-INTENSITY MILLIMETER-WAVE RADIATION [BIOLOGICHESKIE EFFEKTY MILLIMETROVOGO IZLUCHENIIA NIZKOI INTENSIVNOSTI]
O. V. BETSKII and A. V. PUTVINSKII Radioelektronika (ISSN 0021-3470), vol. 29, Oct. 1986, p. 4-10. In Russian. refs

The paper examines the possible role of the intense absorption of millimeter (MM) waves by water molecules in the primary mechanism of the response of biological systems to MM-wave irradiation. Data on the interaction of MM waves with simple aqueous systems are presented with emphasis on the convective mixing of aqueous solutions under the effect of low-intensity (1-10 mW/sq cm) MM-wave irradiation. This MM-wave absorption effect is noted to have great clinical significance. B.J.

A87-25498
SPACECRAFT LIFE-SUPPORT SYSTEMS: BIOPHYSICAL PRINCIPLES OF DESIGN AND TESTING [KOSMICHESKIE SISTEMY ZHIZNEOBESPECHENIIA: BIOFIZICHESKIE OSNOVY PROEKTIROVANIIA I ISPYTANIIA]
ALEKSANDR ALEKSANDRO GLUSHKO Moscow, Izdatel'stvo Mashinostroenie, 1986, 304 p. In Russian. refs

Biophysical principles underlying the tasks of designing and testing life-support systems for manned spacecraft and specialized moduli are discussed, together with problems related to conservation of the mass-energy balances. Biophysical aspects of evaluating the adequacy of the heat regulation and water supply of the spacecraft personnel are considered, with special attention given to the problems of maintaining the water balance under conditions of stress, and of evaluating the energy, heat, and water balances for a spacecrew diet. The principles used to design tests for pressure suits and autonomous life-support systems are discussed, along with the biophysical criteria for the control of an autonomous life-support system and of the work capacity of an individual wearing a pressure suit. Finally, the interrelationship between problems of space medicine and ecological biophysics are given consideration. I.S.

A87-25756
THE ROLE OF ROBOTICS IN SPACE
LELLAND A. C. WEAVER (Westinghouse Electric Advanced Production Technology, Ltd., Coventry, England) IN: Space Tech '86; Proceedings of the International Conference, Geneva, Switzerland, May 14-16, 1986 . London, Online International, Ltd., 1986, p. 61-67.

Consideration is given to the monitoring and maintenance of the Space Station's systems and facilities using AI and robotics. The applications of expert systems, signal processing, and voice data entry or speech recognition to the Station are discussed and examples are provided. The capabilities of the Remotely Operated Service Arm, which is based on robotic systems and AI and is to be utilized to repair the Station's systems and facilities are described. The development of the Cell Management Language to coordinate the operations of different machines and create automated factories with automated manufacturing and processing for the space Station is examined. I.F.

A87-25757
A ROBOTIC SYSTEM FOR DEXTEROUS TASKS
PIERGIOVANNI MAGNANI (Fabbrica Italiana Apparecchiature Radioelettriche S.p.A., Milan, Italy) IN: Space Tech '86; Proceedings of the International Conference, Geneva, Switzerland, May 14-16, 1986 . London, Online International, Ltd., 1986, p. 69-89.

There are a range of tasks and operative conditions in the space environment which may be efficiently managed by a 'small dimension dexterous manipulator'. The configuration of such a manipulator and its main characteristics are considered in this paper. The aspects evaluated are: articulation, position/orientation envelope working area, actuation, and sensoriality. The robotic system analyzed is suitable to be mounted on a moving frame, to be brought in the working area, and then to perform a given envelope of tasks. The moving frame can be a service manipulator arm for external space applications or a moving guide for S/C internal applications. Author

A87-25758
THE ROLE OF EXPERT SYSTEMS ON SPACE STATION
D. R. SLOGGETT (Software Sciences, Ltd.; Environmental and Space Systems Group, Farnborough, England) IN: Space Tech '86; Proceedings of the International Conference, Geneva, Switzerland, May 14-16, 1986 . London, Online International, Ltd., 1986, p. 91-107. refs

The planned deployment of the Space Station, and its associated orbital infrastructure, repreents a unique opportunity to evaluate the potential of expert systems to assist in increasing the autonomy, productivity and effectiveness of the Space Station. This paper seeks to address what current technology can provide to achieve this aim, and highlights previous practical examples of Space AI Systems. The paper makes suggestions for practical research programs, that require urgent attention, to pave the way and demonstrate capability in areas of relatively new technology. From this base the paper suggests some practical areas where AI technology can be applied to the Space Station and their resulting benefits. Specific attention is drawn to the application of expert systems to planning and scheduling and the application of expert monitoring systens to assist in fault diagnosis and repair. The paper concludes that urgent attention is required in the area of demonstration programs where low-risk state-of-the-art developments can be undertaken resulting in very real benefits to the Space Station system. Author

A87-25759
SPACE STATION - THE USE OF EXPERT SYSTEMS FOR PLANNING
JENS GULDBERG and JENS LANGELAND (Computer Resources International A/S, Denmark) IN: Space Tech '86; Proceedings of the International Conference, Geneva, Switzerland, May 14-16, 1986 . London, Online International, Ltd., 1986, p. 109-117. refs

Expert systems have been shown to provide useful techniques for handling planning problems related to the operation of complex systems and to system engineering. A brief review of the principle features of such planning systems is used as a reference for a discussion on relevant applications for the Space Station, which include, e.g., mission planning, scheduling of maintenance, software development, payload design, and check-out procedures. Author

A87-25839* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ON THE SELECTION AND EVALUATION OF VISUAL DISPLAY SYMBOLOGY FACTORS INFLUENCING SEARCH AND IDENTIFICATION TIMES
ROGER REMINGTON (NASA, Ames Research Center, Moffett Field, CA) and DOUGLAS WILLIAMS (Psycho-Linguistic Research Associates, Menlo Park, CA) Human Factors (ISSN 0018-7208), vol. 28, Aug. 1986, p. 407-420. refs

Three single-target visual search tasks were used to evaluate a set of cathode-ray tube (CRT) symbols for a helicopter situation display. The search tasks were representative of the information extraction required in practice, and reaction time was used to measure the efficiency with which symbols could be located and identified. Familiar numeric symbols were responded to more quickly than graphic symbols. The addition of modifier symbols, such as a nearby flashing dot or surrounding square, had a greater disruptive effect on the graphic symbols than did the numeric characters. The results suggest that a symbol set is, in some respects, like a list that must be learned. Factors that affect the time to identify items in a memory task, such as familiarity and visual discriminability, also affect the time to identify symbols. This analogy has broad implications for the design of symbol sets. An

attempt was made to model information access with this class of display. Author

A87-25840* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
STATISTICAL DEPENDENCY IN VISUAL SCANNING
STEPHEN R. ELLIS (NASA, Ames Research Center, Moffett Field, CA; California, University, Berkeley) and LAWRENCE STARK (California, University, Berkeley) Human Factors (ISSN 0018-7208), vol. 28, Aug. 1986, p. 421-438. refs
(Contract NCC2-86)

A method to identify statistical dependencies in the positions of eye fixations is developed and applied to eye movement data from subjects who viewed dynamic displays of air traffic and judged future relative position of aircraft. Analysis of approximately 23,000 fixations on points of interest on the display identified statistical dependencies in scanning that were independent of the physical placement of the points of interest. Identification of these dependencies is inconsistent with random-sampling-based theories used to model visual search and information seeking. Author

A87-25841* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE EFFECT OF PERSPECTIVE GEOMETRY ON JUDGED DIRECTION IN SPATIAL INFORMATION INSTRUMENTS
MICHAEL WALLACE MCGREEVY and STEPHEN R. ELLIS (NASA, Ames Research Center, Moffett Field, CA) Human Factors (ISSN 0018-7208), vol. 28, Aug. 1986, p. 439-456. refs

Attention is given to the methodology and results of an experiment examining design aspects of panel-mounted displays that (1) incorporate a planar grid in their symbology, (2) subtend a narrow visual angle, and (3) are mounted so that they can be viewed face-on rather than obliquely. An analysis of direction judgments in such perspective displays shows that the perspective geometry of the stimulus image has a significant effect on direction judgment accuracy. Target elevation direction is generally overestimated; azimuth error varies sinusoidally with target azimuth direction, and is modulated by field-of-view angle. O.C.

A87-25984
AUTOMATION AND ROBOTICS WITH AEROSPACE APPLICATIONS
D. O. REUDINK (AT&T Bell Laboratories, Holmdel, NJ) IN: Aerospace Applications Conference, Steamboat Springs, CO, Feb. 1-8, 1986, Digest . New York, Institute of Electrical and Electronics Engineers, Inc., 1986, 13 p. refs

A Space Station making extensive use of automation and robotics (A&R) will be more flexible and adaptable than one incorporating fewer A&R features; it will in addition have lower operating costs, improved reliability, and greater autonomy. It is also expected to be capable of performing robot and teleoperator tasks unsuited to humans, such as the assembly of large space structures, due to the hazardous conditions to which they would be exposed. It is accordingly recommended that the NASA Space Station be used as a medium for the promotion of A&R. Attention is presently given to the development status and spinoff advantages of developments in robotic vision. O.C.

A87-26698
STEREOSCOPIC DISPLAYS AND THE HUMAN DUAL VISUAL SYSTEM
ROBERT E. CLAPP (Gould, Inc., Systems and Simulation Div., Tampa, FL) IN: Advances in display technology VI; Proceedings of the Meeting, Los Angeles, CA, Jan. 23, 24, 1986 . Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1986, p. 41-52. refs

Human stereoscopic vision processes for perceiving the environment are examined. Binocular cues, such as retinal disparity, convergence, and accommodation, and monocular cues, such as visual perspective, movement parallax, and relative size, for ocular perception of visual space are described. The functions and interactions of the ambient and focal modes of the human dual visual system are discussed. Consideration is given to the characteristics and operations of the anaglyphs and autostereoscopic system for three-dimensional displays, three-dimensional displays generated by aerial image systems, and the processing of stereoscopic data using three-dimensional imagery and the dual visual system. I.F.

A87-26699
VISUAL SIMULATION THE OLD WAY
GARY G. GOMES (Logicon, Inc., Tactical and Training Systems Div., San Diego, CA) IN: Advances in display technology VI; Proceedings of the Meeting, Los Angeles, CA, Jan. 23, 24, 1986 . Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1986, p. 102-106.

A cost effective and supportable color visual system has been developed to provide the necessary visual cues to United States Air Force B-52 bomber pilots training to become proficient at the task of inflight refueling. This camera model visual system approach is not suitable for all simulation applications, but provides a cost effective alternative to digital image generation systems when high fidelity of a single movable object is required. The system consists of a three axis gimballed KC-135 tanker model, a range carriage mounted color augmented monochrome television camera, interface electronics, a color light valve projector and an infinity optics display system. Author

N87-17433# Drexel Univ., Philadelphia, Pa. Biomedical Engineering and Science Inst.
AN EXPERIMENTAL MICROCOMPUTER CONTROLLED SYSTEM FOR SYNCHRONIZED PULSATING ANTI-GRAVITY SUIT Interim Report
THOMAS MOORE, JOANNE FOLEY, B. R. REDDY, FRANK KEPICS, and DON JARON Jul. 1986 22 p
(Contract N00014-85-K-0566)
(AD-A174640; NADC-86119-60) Avail: NTIS HC A02/MF A01
CSCL 06Q

This report describes an experimental system to deliver Synchronized External Pressure Pulsations (SEP) to the lower body. The system is designed using a micro-computer with a realtime interface and an electro-pneumatic subsystem capable of delivering pressure pulses to a modified anti-G suit at a fast rate. It is versatile, containing many options for synchronizing, phasing and sequencing of the pressure pulsations. Details of its software and hardware are described along with the results of initial testing in a Dynamic Flight Simulator on human volunteers. GRA

N87-17434# Virginia Polytechnic Inst. and State Univ., Blacksburg. Human Factors Lab.
UNITARY SUPRATHRESHOLD COLOR-DIFFERENCE METRICES OF LEGIBILITY FOR CRT RASTER IMAGERY Technical Report, 1982 - 1985
THOMAS M. LIPPERT and HARRY L. SNYDER Sep. 1986 107 p
(Contract N00014-78-CK-0238)
(AD-A175062; HFL/ONR-86-3) Avail: NTIS HC A06/MF A01
CSCL 05J

This research examined the relationships between color contrast and legibility for digital raster video imagery. CIE colorimetric components were combined into three-dimensional color coordinate systems whose coordinates map one-to-one with the physical energy parameters of all colors. The distance between any two colors' coordinates in these 3-spaces is termed Color-Difference (Delta E). Delta A was hypothesized as a metric of the speed (RS) with which observers possessing normal vision could accurately read random numeral strings on one color displayed against backgrounds of another color. Two studies totalling 32064 practice and experimental trials were conducted. The first study determined that the CIE Uniform Color Spaces are inappropriate for the modelling of RS. Subsequently, a different 3-space geometry and colorimetric component scaling were empirically derived from the Study 1 data to produce a one-dimensional Delta E scale which approximates an interval scale of RS. This Delta E scale and others were then applied to the

different stimulus conditions in Study 2 to determine the generalizability of such Delta E metrics. GRA

N87-17435# Technische Hogeschool Twente, Enschede (Netherlands). Dept. of Applied Mathematics.
MODEL OF THE HUMAN CONTROLLER OF A DYNAMIC SYSTEM
P. H. WEWERINKE Aug. 1986 25 p
(MEMO-580; ISSN-0169-2690; ETN-87-99059) Avail: NTIS HC A02/MF A01

A model of the human controller of a dynamic system involving regulating and tracking a desired finite trajectory in an optimal sense is presented. The latter concerns control behavior at a higher mental level involving planning (finite time, open loop control) and decision making (control intermittency). It is assumed that the human operator derives information about the system from instruments and/or the visual scene. This complex visual information process and the control and decision making behavior is described in terms of stochastic optimal estimation control and decision theory. ESA

N87-17772*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MANNED MARS MISSION CREW FACTORS
PATRICIA A. SANTY *In* NASA. Marshall Space Flight Center Manned Mars Mission. Working Group Papers, V. 2, Sect. 5, App. p 606-612 May 1986
Avail: NTIS HC A24/MF A01 CSCL 05H

Crew factors include a wide range of concerns relating to the human system and its role in a Mars mission. There are two important areas which will play a large part in determining the crew for a Mars mission. The first relates to the goals and priorities determined for such a vast endeavor. The second is the design of the vehicle for the journey. The human system cannot be separated from the other systems in that vehicle. In fact it will be the human system which drives the development of many of the technical breakthroughs necessary to make a Mars mission successful. As much as possible, the engineering systems must adapt to the needs of the human system and its individual components. Author

N87-17788*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A PHYSICOCHEMICAL ENVIRONMENTAL CONTROL/LIFE SUPPORT SYSTEM FOR THE MARS TRANSIT VEHICLE
MELAINE M. SEDEJ *In* NASA. Marshall Space Flight Center Manned Mars Mission. Working Group Papers, V. 2, Sect. 5, App. p 787-796 May 1986
Avail: NTIS HC A24/MF A01 CSCL 05H

The environmental control/life support system (ECLSS) must be small and maintenance free as possible to allow maximum mission flexibility. A physiocochemical ECLSS concept similar in many ways to several of the partially closed ECLSS concepts proposed for the space station is discussed. However, this concept elmininates several of the space station ECLSS subsystems and potentially eliminates the use of cryogenics and high-pressure gaseous storage. Author

N87-17797*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MANNED MARS MISSION ENVIRONMENTAL CONTROL AND LIFE SUPPORT SUBSYSTEM
UWE HUETER *In its* Manned Mars Mission. Working Group Papers, V. 2, Sect. 5, App. p 901-909 May 1986
Avail: NTIS HC A24/MF A01 CSCL 06K

A specific design is not presented, but the general philosophy regarding potential Environmental Control/Life Support System (ECLSS) requirements, concepts, issues, and technology needs are discussed. The focus is on a manned Mars mission occurring in the late 1990's. Discussions on the Trans-Mars Vehicle, the Mars Excursion Module (MEM), and a Martian base facility are covered. The functions, performance requirements, and design loads of a typical ECLSS are listed, and the issues and technology briefly discussed. Several ECLSS concepts and options are identified, and comparative weights and volumes are provided for these. Several aspects of the space station ECLSS are contrasted with the Mars element ECLSS. Author

N87-17798*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PHYSIOLOGICAL AND TECHNOLOGICAL CONSIDERATIONS FOR MARS MISSION EXTRAVEHICULAR ACTIVITY
JAMES M. WALIGORA and MELAINE M. SEDEJ *In* NASA. Marshall Space Flight Center Manned Mars Mission. Working Group Papers, V. 2, Sect. 5, App. p 910-926 May 1986
Avail: NTIS HC A24/MF A01 CSCL 06K

The nature of the suit is a function of the needs of human physiology, the ambient environment outside the suit, and the type of activity to be accomplished while in the suit. The physiological requirements that must be provided for in the Martian Extravehicular Activity (EVA) suit will be reviewed. The influence of the Martian environment on the EVA suit and EVA capabilities is elaborated, and the Martian environment is compared with the lunar environment. The differences that may influence the EVA design are noted. The type, nature, and duration of activities to be done in transit to Mars and on the Martian surface will be evaluated and the impact of these activities on the requirements for EVA systems will be discussed. Furthermore, the interaction between Martian surface transportation systems and EVA systems will be covered. Finally, options other than EVA will be considered such as robotics, nonanthropometric suits, and vehicles with anthropometric extremities or robotic end effectors. Author

N87-18315# New York Univ., New York.
NEUROMAGNETIC INVESTIGATION OF WORKLOAD AND ATTENTION Final Report, 1 Jan. 1982 - 31 Dec. 1984
LLOYD KAUFMAN and SAMUEL J. WILLIAMSON 24 Jun. 1986 51 p
(Contract F49620-82-K-0014)
(AD-A173155; AFOSR-86-0913TR; FR-1) Avail: NTIS HC A04/MF A01 CSCL 05J

Major advances were made in the technology associated with neuromagnetic measurements. These included the demonstration of the effectiveness of electronic cancellations in reducing unwanted effects of ambient field noise. Also developed were a high-precision sensor positioning system, a device for accurately positioning the subject's head under the sensors, and advanced software for a multi-sensor system. Experiments during this period included one in which we demonstrated modulation of the EEG coincident with the onset of the N100 component of a visual response to infrequent stimuli presented under the oddball paradigm. We collaborated on another experiment with the Cognitive Psychophysiology Laboratory of the University of Illinois in a study of P300 related to the presentation of alphanumeric stimuli. The results confirmed earlier findings using abstract visual stimuli, i.e., the equivalent current dipole source of P300 is in or near the hippocampal formation. GRA

N87-18316# Nationaal Inst. voor Kernfysica en Hoge Energiefysica, Amsterdam (Netherlands). Sectie-K.
A NEW PHILOSOPHY FOR THE CENTRAL CONTROL FACILITY OF MEA [EEN NIEWWE FILOSOFIE VOOR DE CENTRALE BEDIENINGSFACILITEIT VAN MEA]
FRED SCHIMMEL 23 Jul. 1986 31 p In DUTCH
(LINO-131; ETN-87-99147) Avail: NTIS HC A03/MF A01

Suggestions for improvements of the MEA control system are given to make the deviation hall AFBU controllable from the central console. The console apparatus and functions, the commands, and the organization and maintenance of the software are described. ESA

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SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

A87-25812
ROLE OF AMPHIPHILIC COMPOUNDS IN THE EVOLUTION OF MEMBRANE STRUCTURE ON THE EARLY EARTH
DAVID W. DEAMER (California, University, Davis) Origins of Life (ISSN 0302-1688), vol. 17, 1986, p. 3-25. refs

A variety of amphiphilic compounds have the capacity to self-assemble into membranous structures in the form of bilayers. The earliest cellular organisms must have incorporated such compounds into boundary membranes. This review discusses amphiphilic components of the prebiotic environment which would be candidates. One possible source is organic material carried to the earth's surface by meteoritic infall. To test this hypothesis, nonpolar substances were extracted from the Murchison carbonaceous chondrite and analyzed. It was found that at least some of the components can produce boundary structures which resemble membranes. This observation suggests that membranous boundary structures were present on the early earth, and were available to participate in the origin and evolution of the first cellular forms of life. Author

A87-25813* Salk Institute for Biological Studies, San Diego, Calif.
DID TEMPLATE-DIRECTED NUCLEATION PRECEDE MOLECULAR REPLICATION?
LESLIE E. ORGEL (Salk Institute for Biological Studies, San Diego, CA) Origins of Life (ISSN 0302-1688), vol. 17, 1986, p. 27-34. NASA-NIH-supported research. refs

It is proposed that mononucleotides incorporated into the surfaces of microcrystals of inorganic phosphates such as hydroxyapatite can act as templates to assemble complementary mononucleotides from solution, and that the phosphate groups of the assembled nucleotides can facilitate nucleation of a second hydroxyapatite crystal. This would provide a mechanism of replication that is subject to natural selection. The possible role of a replicating system of this kind in the origins of life on the earth is discussed. Author

A87-25815
INVESTIGATION ON THE ASYMMETRICAL INDUCED YIELDS IN (SR-90)-(Y-90)-BETA-IRRADIATED D- AND L-ALANINES
E. CONTE (Bari, Universita; ITEN, Laboratorio di Radioattivita e Metodologie Radioisotopiche, Bari, Italy), G. FANFANI, R. AMEROTTI, A. DADDABBO (Bari, Universita, Italy), and M. PIERALICE (Bari, Universita; ITEN, Laboratorio di Radioattivita e Metodologie Radiosotopiche, Bari, Italy; CNR, Servizio di Sicurezza del Lavoro e Protezione Sanitaria, Rome, Italy) Origins of Life (ISSN 0302-1688), vol. 17, 1986, p. 51-57. refs

The effect of irradiation by beta rays on the asymmetric decomposition of D- and L-alanines was investigated, using ESR spectra for the analysis. The experimental procedure was as follows: irradiation of D- and L-alanine samples with Co-60 to obtain the value of gamma-induced decomposition (D-gamma); subsequent irradiation of samples (with similar yields of D-gamma) with beta rays from (Sr-90)-(Y-90) and determination of the D-beta value; and the measurement of the ehancement of the major peak in the ESR spectrum by the difference between the values of D-beta and D-gamma. The asymmetrical yields induced in (Sr-90)-(Y-90)-beta-irradiated alanines were 10 percent higher in D-alanine than in L-alanine, indicating that a possible source of the asymmetry induced in the original racemic mixture of prebiotic amino acids could be the action of beta rays from the radioactive natural elements. I.S.

A87-25816
CHEMICAL EVOLUTION OF IRON CONTAINING ENZYMES - MIXED LIGAND COMPLEXES OF IRON AS INTERMEDIARY STEPS
MR. KAMALUDDIN, MALA SINGH, and SUSHAMA W. DEOPUJARI (Roorkee, University, India) Origins of Life (ISSN 0302-1688), vol. 17, 1986, p. 59-68. Research supported by the Indian Space Research Organisation. refs

The catalytic activities of several Fe(II) complexes towards some redox reactions of biological importance, such as the decomposition of H2O2 and the dehydrogenation of NADH and ascorbic acid (both coupled with reduction of methylene blue), were measured at three different pH values. The catalytic activities of the Fe(II) complexes investigated increased in the order: K4/Fe(CN)6/ - K4/Fe(CN)5(gly)/ K4/Fe(CN)5(trigly)/ at all pH's. On the basis of these results and some literature data, a hypothesis on the evolution of iron-containing enzymes is proposed, according to which the order of formation of the enzyme from the Fe(2+) ion was as follows: Fe(2+) - Fe(II) cyanide complexes - mixed-ligand Fe(II) cyanide and amino acid complexes - Fe(II) complexes of macromolecules Fe(II)-containing proenzyme or early enzyme. I.S.

A87-25817* Rensselaer Polytechnic Inst., Troy, N.Y.
THE ADSORPTION AND REACTION OF ADENINE NUCLEOTIDES ON MONTMORILLONITE
JAMES P. FERRIS and WILLIAM J. HAGAN, JR. (Rensselaer Polytechnic Institute, Troy, NY) Origins of Life (ISSN 0302-1688), vol. 17, 1986, p. 69-84. refs
(Contract NSF CHE-83-04466; NGR-33-018-148)

The binding of AMP to Zn(2+)-montmorillonite is investigated in the presence of salts and Good's zwitterion buffers, PIPES and MES. The initial concentrations of nucleotide and the percent adsorbtion are used to calculate the adsorption isotherms, and the Langmuir adsorption equation is used for the analysis of data. The adsorption coefficient was found to be three times greater in the presence of 0.2 M PIPES than in its absence. In addition, basal spacings measured by X-ray diffraction were increased by the buffer. These results are interpreted in terms of a model in which the adsorption of AMP is mediated by a Zn(2+) complex of PIPES in different orientations in the interlamellar region of the montmorillonite. Mixed ligand complexes of this type are reminiscent of the complexes observed between metal ions and biological molecules in living systems. I.S.

A87-25818* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
KINETICS OF THE HYDROLYSIS OF GUANOSINE 5'-PHOSPHO-2-METHYLIMIDAZOLIDE
ANASTASSIA KANAVARIOTI (NASA, Ames Research Center, Moffett Field, CA) Origins of Life (ISSN 0302-1688), vol. 17, 1986, p. 85-103. Research supported by the National Research Council and NASA. refs

The hydrolysis kinetics of guanosine 5'-phospho-2-methyl-imidazolide (2-MeImpG) in aqueous buffered solutions of various pH's was studied at 75 and 37 C, using spectrophotometric and HPLC techniques. The hydrolysis was found to be very slow even at low pH. At 75 C and pH at or below 1.0, two kinetic processes were observed: the more rapid one was attributed to the hydrolysis of the phosphoimidazolide P-N bond; the second, much slower one, was attributed to the cleavage of the glycosidic bond. It is noted that the P-N hydrolysis in phosphoimidazolides is very slow compared to other phosphoramidates, and that this might be one of the reasons why the phosphoimidazolides showed an extraordinary ability to form long oligomers under template-directed conditions. I.S.

A87-26853
THE SEARCH FOR BIOMOLECULES IN SPACE
LEWIS E. SNYDER (Illinois, University, Urbana) IN: The search for extraterrestrial intelligence; Proceedings of the Workshop, Green Bank, WV, May 20-22, 1985 . Green Bank, WV, National Radio Astronomy Observatory, 1986, p. 39-45; Discussion, p. 45-50. refs
(Contract NSF AST-82-17547)

The search for and study of biologically relevant interstellar molecules are examined. A table of 68 observed interstellar molecular species is presented; the smaller molecules were detected in the short millimeter and submillimeter ranges of spectra, and the large species were observed in the longer millimeter and centimeter ranges. The chemical processes in interstellar clouds potentially related to the evolution of biology on earth are studied. The benefits provided to the study of interstellar clouds by the use of interferometry and molecular spectroscopy are discussed. Consideration is given to data collected from cometary studies.
I.F.

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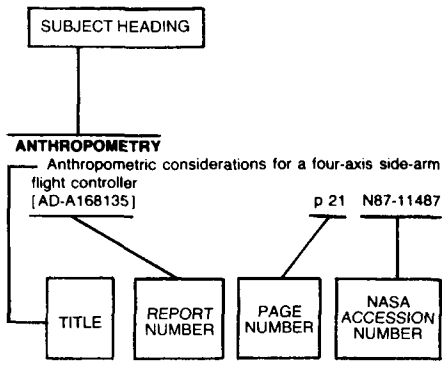

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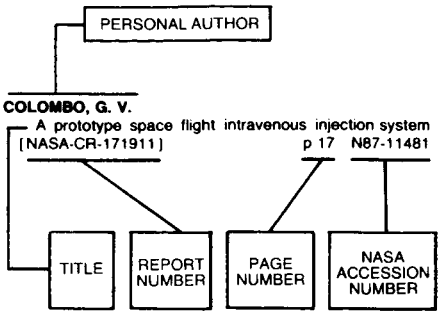

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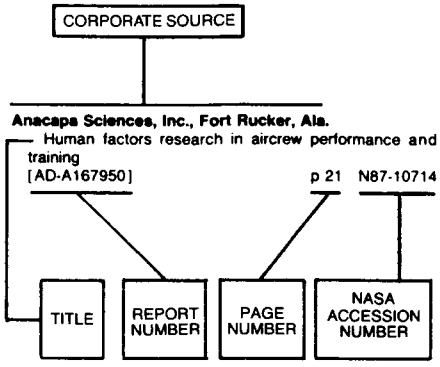

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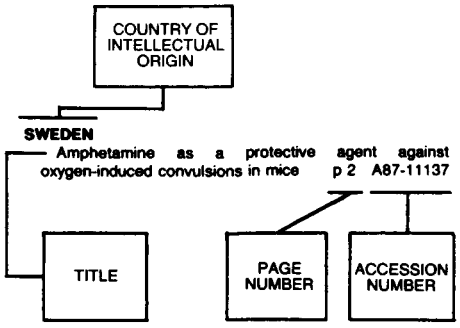

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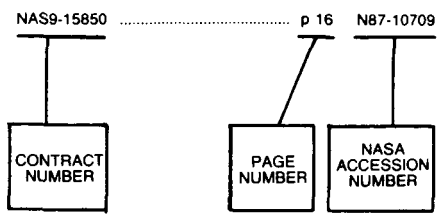

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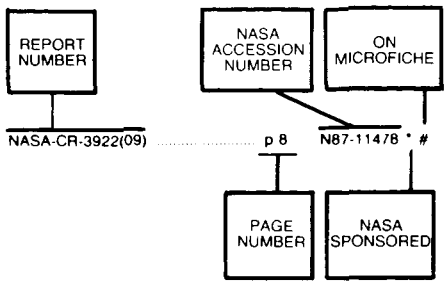

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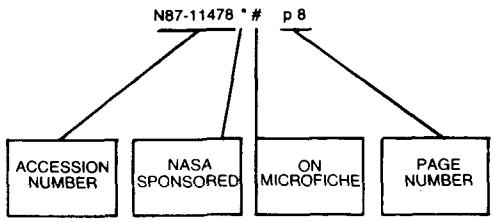

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